URBAN FORESTRY MANAGEMENT PLAN

KETCHIKAN GATEWAY BOROUGH

MARCH 8, 2010

Ketchikan Gateway Borough
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URBAN FORESTRY MANAGEMENT PLAN

FOR

Ketchikan Gateway Borough
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EXECUTIVE SUMMARY

Ketchikan's Urban Forest Management Plan (UFMP) was initiated by the Alaska Department of Natural Resource Division of Forestry Community Forestry Program and funded by a USDA Forest Service grant and the Ketchikan Gateway Borough (KGB) Public Works Department to facilitate the city's ongoing commitment to maintain, enhance, and preserve Ketchikan's tree canopy.

The UFMP provides detailed information and recommendations to improve Ketchikan's community forest. Improving the community forest is no simple task. Trees are generally overlooked as an important and integral part of the urban infrastructure. Communities must be compelled to always include the aspects and needs of trees when they make decisions about transportation, water quality, energy costs, beautification, and climate mitigation. Urban trees are sometimes placed in poor locations in conflict with other city infrastructure and often suffer from long-term maintenance neglect. Community trees can only provide maximum benefits when coordinated with the complex city infrastructure. Improving Ketchikan's street and park trees and conservation areas involves many objectives that will need to be funded and fulfilled if the community's vision for its trees is to be realized. The implementation of the UFMP will ultimately contribute to the quality of life in Ketchikan through enhancements to the tree population.

The objectives of the management plan support the primary vision and mission of improving Ketchikan's community through proper management of one of the borough's most valuable assets – trees. The UFMP follows the program vision to retain a high quality of life by focusing on actions to increase the benefits and values of trees, and to improve on the responsible management of Ketchikan's urban forest. Borough administrators, elected officials, borough staff, and citizens should have this vision for the future of the Ketchikan's urban forest:

Ketchikan Gateway Borough Urban Forestry Vision Statement

The Ketchikan Gateway Borough, recognizing the value of city trees as an important part of the community's infrastructure, intends to manage, foster, and promote the maintenance of community trees using the best management practices to sustain a vibrant, healthy, and safe community forest resource for the benefit of Ketchikan's residents, visitors, and ecosystem.

The primary goal is to assure that healthy urban trees reach maturity, continue to thrive, and not create future problems or conflicts with other infrastructure. The UFMP supports these concepts and includes a program mission statement. The objectives have been developed to address the challenges and issues that confront the borough's trees and their stewardship. The objectives are dependent on one another and build upon the success of their implementation. Removing, pruning, planting, and preserving trees; educating stakeholders; and improving coordination and communication among citizens, tree board, borough staff, and elected officials must be comprehensive for the UFMP to succeed.

Ketchikan Gateway Borough Urban Forestry Mission Statement
The Ketchikan Gateway Borough and Tree Board are dedicated to provide proactive management, maintenance, and preservation of trees within the borough and to provide quality customer service, education resources, and volunteer opportunities to ensure the long term safety, health, viability, and aesthetic quality of trees in our community.

The UFMP guidelines promote considering city trees as major and important urban infrastructure. It outlines best practices to incorporate trees into the urban framework. The UFMP provides for the development of a progressive long-range urban and community forestry program that will result in a healthier and safer forest in Ketchikan. Acknowledging trees' major contribution to Ketchikan, the goal of this management plan is to provide a strategic approach to sustaining community trees. Increasing knowledge of the measurable benefits of urban trees, combined with a large number of visitors spending time in Ketchikan, compels the community to have a responsibility to ensure the success of their provision and care for urban trees. The UFMP is a tool to be used for guiding the tree program and garnering support, cooperation, and funding for the tree program.

MANAGEMENT GOALS

The UFMP establishes these management goals for the Ketchikan Gateway Borough (KGB).

- Adopt and implement the Urban Forestry Management Plan.
- Increase urban forestry funding
- Continue to educate staff to meet industry work practices.
- Implement a cyclic pruning program for young and mature trees.
- Remove high-risk trees.
- Create a tree planting plan; promote proper planting of new trees and diversification of species.
- Maintain the inventory of public trees.
- Create a tree ordinance to incorporate the recommendations and goals of the borough's tree management plan, adopt the ordinance into the borough code, and implement ordinance enforcement practices.
- Enhance the design of the downtown with tree plantings.
- Provide education and public awareness of the importance of the trees to the community; educate borough staff and the community on proper tree care; and encourage greater participation in tree steward activities.

The recommendations made in this plan are intended to be considered and implemented over a period of five to ten years.

Trees are long-lived organisms. Maintaining existing trees and planting trees today will provide benefits for current and future generations. By having systematic tree planting and maintenance programs in place, and by having adequate funding, staffing, regulations, and public education resources today, the future public tree population and overall urban forest will thrive, expand, and be sustainable.

These goals may change over time, both through completion of specific projects and through the changing nature and composition of the tree program and tree populations over the years.

MANAGEMENT RECOMMENDATIONS

These recommendations are based on program management goals and are preliminary steps to enhancing the urban forestry management program for the borough. The following table contains a summary of the management goals contained in the UFMP.

TYPE	RECOMMENDATION	DESCRIPTION	PAGE
Program Planning	Effective administration	Responsibility for administration of community tree program	14
	Five-year management plans	Create five year plans that are first level of operational planning	14
	Annual operating plans	Create annual work plans to direct day-to-day operations	15
	Communications strategy	Create a strategy to capture key stakeholders and broader community input to the vision and goals for the future management plan development	16
	Urban forestry tree board	Engage tree board in program development, annual operating plans, and community outreach.	19
	Tree planting plan	Develop a comprehensive planting plan that reflects the community values and desires.	19
Risk Management	Risk tree management	Managing tree risk and reducing borough liability	20
	Risk tree abatement	High risk trees should be inspected as soon as possible and removed to reduce risk to residents, visitors, and facilities.	23
	Tree inspections	Establish an inspection routine using a trained PNW-ISA certified tree risk assessor to inspect trees regularly for risk and maintenance treatments.	24
Maintenance	Tree maintenance	Establish tree maintenance program	25
	Tree pruning	Establish a proactive cyclic pruning program.	26
	Mature tree care	Establish a two to five year cyclic pruning program for mature trees	27
	Young tree pruning program	Implement a pruning program for new trees to establish structure and branch architecture	28
Planting	Tree planting	Establish annual planting program	31

	Tree planting practices	Install new trees with root collar at grade level; treat circling and girdling roots at the time of installation.	34
	Mulching	Apply mulch in 10 foot diameter circles to all new tree installations and recently planted trees to avoid mower and weed eater damage.	35
	Diversification	Install many varieties of trees. No single species should account for more than 10% of the population.	36
	Diameter distribution	Create a program that strives to increase the population of large stature trees.	37
Recycling Wood Waste	Recycle wood waste	Recycle tree residue for use as secondary products, mulch, biomass, fuel production or composting.	39
Tree Protection	Construction protection	Require contractors to use best arboriculture practices to protect trees in construction areas.	40
	Vandalism	Use public outreach and education to reduce vandalism and accidental tree injury.	41
	Young tree protection	Fence trees; install tree guards to prevent animal damage, vandalism and injury.	41
Management Information	Tree inventory	Inventory public trees to enhance short and long-term management of public trees.	42
	Data use and tree analysis	Use the inventory to track and report current planting, pruning, removal and other program maintenance history. Make tree data available to the public, to local schools for science projects, and to other borough departments for projects associated with public trees.	42
Ordinance Review	Tree ordinance development	Write a tree ordinance with community input to reflect current arboriculture practices, address program goals, and meet community needs.	43
Downtown Trees	Design, planning, and planting	Design and develop sites conducive to tree planting and tree growth.	47
Operational Review	Develop and enhance program functions and funding	Improve program budget, leadership communication, staffing, staff training, and political support.	54

Program Actions	Short-term actions	Recommendations for short-term management actions	61
	Long-term actions	Recommendations for long-term management actions	64

The UFMP initiates an effort by the borough to form systematic management strategies for the public tree population of Ketchikan. Short and long term goals are addressed in detail in the UFMP and listed below.

SHORT-TERM ACTION ITEMS

There are four program management elements that must be addressed on an annual basis: Risk Tree Abatement, Proper Tree Maintenance, Tree Planting, and Program Administration. Although each of these objectives is essential to the maintenance of the community forest, an annual plan should be established to determine where budget dollars will be spent. The UFMP recommendations have established public safety, responsible management of existing trees, and tree planting as highest priorities.

LONG-TERM ACTION ITEMS

Long-range planning mainly concerns program enhancement and involves the completion of recommendations in the management plan. There are five program management elements that must be addressed to sustain the community's tree program and trees: Community Forestry Management Plan Adoption and Implementation, Increase Funds Spent on Community Trees, Community Outreach and Education, Tree Ordinance Revision, and Downtown Tree Design and Planting.

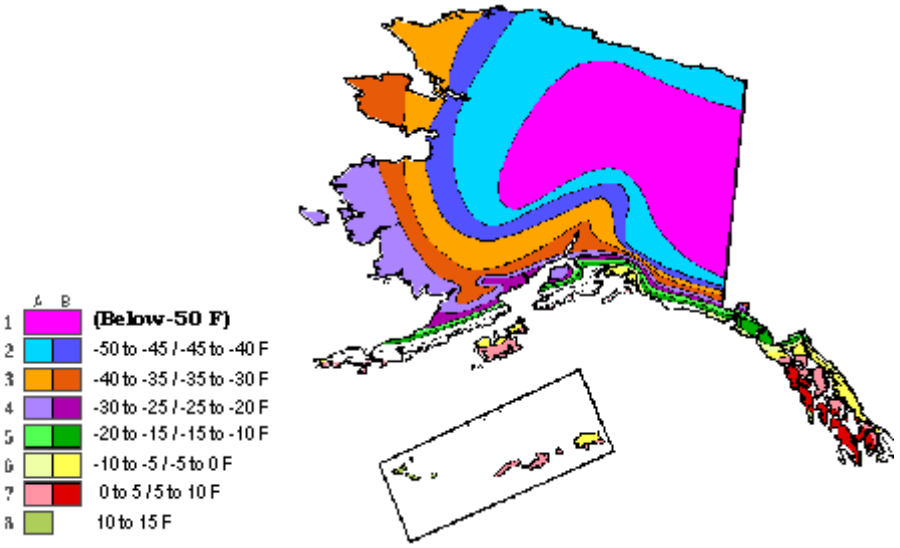
The recommendations and actions will help conserve Ketchikan's tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of Ketchikan today and tomorrow.

INTRODUCTION

In 2009, the Alaska Department of Natural Resources Community Forestry Program provided grant funding to assist the Ketchikan Gateway Borough (KGB) to begin a public tree inventory and develop a management plan to guide the management of the community trees. The borough also provided staff and funds to match the grant and support the project.

Ketchikan, located on Revillagigedo Island, is the home of more than 8,000 people. According to the United States Census Bureau, the borough has a total area of 4.1 square miles; 3.4 square miles of it is land and 0.8 square miles of it (18.60%) is water.

- Average annual rainfall is 152 inches; annual average snowfall is 37 inches.
- The average high temperature in July is 65 °F, and the average high temperature in January is 39 °F.
- The USDA Plant Hardiness Zones divide the United States and southern Canada into 11 areas based on a 10 degree Fahrenheit difference in the average annual minimum temperature. Ketchikan's average annual minimum temperature is between 0 °F and 10 °F.



Ketchikan is in the heart of the 17 million acre Tongass National Forest, the largest in the United States. This temperate rain forest is integral to the lifestyle of Southeast Alaska. It provides habitat for a rich abundance of plant, birds, and animal life. The temperate rain forest is biologically diverse, productive, and provides the setting for the community trees of Ketchikan.

Vision Statement

The vision statement describes how the community wants its landscapes to look and function in the future. This brief paragraph describes the desired outcomes of the plan. It includes sentiments about the importance of a community's trees and natural resources in terms of attractiveness, sustainability, people's health, safety, economic prosperity, and provisions for future generations.

Ketchikan Gateway Borough Urban Forestry Vision Statement
The Ketchikan Gateway Borough, recognizing the value of city trees as an equal part of the community's infrastructure, intends to manage, foster, and promote the maintenance of community trees using the best management practices to sustain a vibrant, healthy, and safe community forest resource for the benefit of Ketchikan's residents, visitors, and ecosystem.

Tree Benefits

Few elements of the grey infrastructure of urban places can be said to boost property values, support retail activity, improve municipal health, protect water quality, reduce stromwater runoff, counter climate change, provide wildlife habitat, and ensure roadway safety-all at once. Communities looking for these benefits may be surprised to find a solution right in their own backyards, along their streets, and in their parks. The green infrastructure of trees, along with parks and open space, provide a wealth of benefits to Ketchikan (Figure 1).

Figure 1 - Ketchikan's downtown district is clearly lacking trees.

The impact that trees make on our communities is tremendous and although we can quantify some of their benefits, we cannot always quantify the social and psychological values. But we know they exist. People in communities mourn the loss of trees from

storms or from other problems. People often rally around planting, protecting, and ensuring that trees are a part of their neighborhoods and communities.
Trees have many positive impacts on the environment and community. Community forests convey a number of quantifiable benefits which can be enhanced through management. A well managed urban forest provides valuable services. Their primary benefits include:

- Trees are a community asset worth more than $790,000.00
- Mitigating climate changes by reducing green house gases
- Storing and sequestering carbon dioxide
- Improving air quality
- Removing pollution
- Phytoremediation
- Intercepting rainfall
- Stormwater rate control which reduces erosion and stabilizes soil and slopes
- Improving water quality
- Facilitating stormwater infiltration/treatment

Additional benefits of urban trees include:

- Increased property values
- Social and psychological benefits
- Crime reduction
- Increased aesthetics
- Enhances business in downtown business districts. Tree canopies provide shelter for pedestrians during rain storms.
- Human health benefits
- Wildlife habitat
- Moderates water temperatures
- Creates micro-climates for humans along urban streets

Environmental, economic and social urban forest services and values are well documented in scientific and technical journals. A summary of key values and benefits, and some supporting sources, is provided below.

- Trees provide benefits associated with physical, mental and social human health (Dwyer et al 1992; Ulrich and Parsons 1992; Sorte 1995; Grahn and Stigsdotter 2003; Kuo 2003).
- Trees help to conserve energy by indirectly mitigating climatic effects through providing evaporative cooling, windbreak and shading functions, thus reducing human dependence on power generation (Pouyat and McDonnell 1991; McPherson and Simpson 1994; Nowak 1994;).
- Trees improve air quality by producing oxygen, absorbing pollutants and sequestering carbon (Rowntree and Nowak 1991; Nowak 1992; McPherson et al 1999; American Forests 2007).
- Trees contribute to water quality and quantity improvement through storm water control, attenuation of peak flows, maintenance of base flow, erosion control and rainfall interception (Bernatzky 1983; Xiao et al 1998; Floyd 2002; American Forests 2007).

- Urban forests cool watercourses and mitigate noise and dust (Walton 1998).
- Trees provide habitat and food sources for wildlife such as fish, birds, insects, and small mammals (Tilghman 1987; Friesen et al. 1995).
- Urban forests create an appealing consumer environment in business districts (e.g., Wolf 2003, 2005).
- Trees increase property values (Behe et. al. 2005; Wolf, 2007;)

Appraised Value

Report universe: All ☒ Subset ☐

Total Number of Trees in Report:	192
Total Appraised Value:	$797,190
Total Mean Appraised Value:	$4,152
Median Appraised Value:	$2,500
Minimum Appraised Value:	$0
Maximum Appraised Value:	$27,800

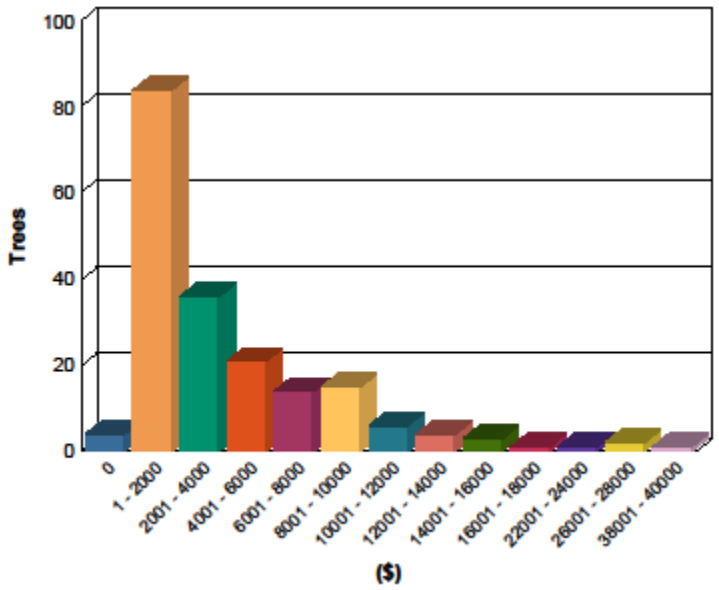


Table 1 – The appraised value of trees was determined from the Council of Tree & Landscape Appraisers Guide for Plant Appraisal, 9th Edition.

Trees in urban areas are valued differently than their rural counterparts. The street and park trees of the Ketchikan represent a considerable economic, social, recreational, and environmental asset to the community. **The public trees inventoried in Ketchikan have a total appraised value over $790,000.00 (Table 1).** Trees and forests are of vital importance to the environmental, social, and economic well-being of the borough. The borough's community forest provides numerous benefits that are both tangible and intangible. Trees are the only asset owned by the borough that increases in value as they age but only if they receive proper maintenance.

Inventory Benefits

Many communities have public street and park trees, a shade tree commission, and plant trees, but how many actually know what the resource looks like, the condition it is in, the benefits it is providing, and how effective their program has been? Whether you are managing a retail store or natural resources, an inventory is critical. Without an inventory of the resource, you don't know what you have, what condition it is in, and what kind of work is needed to maintain or manage it for the future. An inventory also helps you better document the many benefits that trees are providing the community.

A street or park tree inventory provides information for the planning, design, planting, maintenance, and removal of trees. It provides useful information to justify starting and managing a tree program and funding an existing program. An inventory of a community's public trees and planting spaces is a prerequisite for making sound decisions. A community that operates a tree program without an inventory may question the need for an inventory. Previous decisions may have been based on tradition rather than an accurate assessment.

A tree inventory can quantify the answers to many important questions. For example, an inventory can provide the location of risk trees, the number of trees located within the public right-of-way, the value of street and park trees, and the number of available planting sites. In addition, an inventory can help identify insect or disease problems, pruning needs, and work and budget priorities.

With this information, tree boards and staff can better plan and prioritize tree removals, maintenance work, and plantings. They can also determine the value of public trees, which can help emphasize the program's importance. An inventory can be used to monitor tree conditions and quickly and accurately answer management questions, such as where and how many trees should be planted in a year. Over the years, changes in a community forest can be seen in the number, age, condition, and species of trees. A well-maintained inventory can be used in cases of liability to demonstrate that there was no negligence in the inspection or care of these trees. An inventory will also improve the chances of receiving grants and other assistance by providing documentation of the extent and worth of street and park trees.

Management Plan Benefits

Traditional forestry is the management of trees or stands of trees for timber production and other values including wildlife, water quality, and ecological health. Urban forestry is the management of trees and other forest resources in urban ecosystems for the environmental, economic, social, health, and aesthetic benefits trees provide society.

Municipal tree plans provide policy and standards for implementing and managing tree programs. The principal purpose of a community tree plan is to guide the management and maintenance of a community tree program, including tree removal, pruning, planting, funding, volunteer opportunities, and other important work. Tree plans should be consistent with other municipal planning strategies and usually include a vision statement, goals, objectives, and strategies.

In any given city nationwide, buildings and roads receive careful planning and scheduled maintenance. It is widely recognized that neglect of infrastructure planning and maintenance can result in deterioration leading to numerous potential expenses and risks. Why should trees receive any less planning, attention and care? Tree

management plans help cities proactively manage their tree resources to avoid risk, reduce liability, cut maintenance costs, and increase the value of trees. A comprehensive plan helps promote the future health and sustainability of the community's street and park trees, while providing a framework to make difficult decisions about tree removal, preservation, pruning, and planting. Without a proactive approach to tree issues, Ketchikan runs the danger of addressing tree issues reactively – and paying a steep price for maintenance, removal and liability associated with tree failures.

The borough, in partnership with the State of Alaska Community Forestry program has taken the proactive step of creating a comprehensive UFMP. The UFMP was systematically developed by a review of existing borough documents, specifications and standards, tree inventory data; through interviews with key staff and interested citizens, field observations, and by applying national arboriculture standards and best management practices. Field observations of trees along streets, in parks and in the downtown corridor were conducted. This is a customized UFMP for the borough based on local conditions, resources, and priorities.

The UFMP is intended to provide strategies, goals, policies, standards, and actions to protect, enhance, expand, and preserve the working forest for the benefit of the community. The UFMP provides program coordination and improves the boroughs tree management in an equitable, economic, and sustainable manner. Moreover, the UFMP will be a valuable strategic planning tool, serve as a road map to enhance the urban forestry program, and become a part of the borough's comprehensive borough plan.

The UFMP plan will help the members of the tree board, borough staff, and other concerned citizens understand the current condition of the community forest and shape its future. Good tree management involves setting goals and objectives and developing specific management strategies to meet them. Implementations of the UFMP objectives are the foundation of an effective tree management program. It contains goals and objectives that will guide the borough in its actions and decisions affecting public trees.

In developing the UFMP the following parts of a comprehensive municipal tree program are addressed.

- An inventory of street trees, park trees, and other open space areas.
- A community tree plan.
- A street and park tree ordinance.
- Administration by borough staff and tree board.
- Sustainable funding.
- Tree maintenance, annual work plans, and budgets.
- Tree risk management.
- Consideration of trees in development review, planning, and other borough projects.
- Opportunities for public participation and education.

This project follows a trend in urban forestry to move from reactionary management of individual trees—typically characterized by an emergency-response approach to problems and complaints—to a proactive, systematic, and strategic focus on an urban forest system as a whole. While limited municipal funds for forestry programs often

constrain proactive tree care, management planning efforts can increase the efficacy and reach of scarce resources, and have significant impact on the landscape.

Sharing the UFMP could further educational efforts by showing staff, elected officials, and citizens how science informs tree management as well as promoting borough pride. Knowledge gained from this UFMP should also be integrated into other borough plans that impact trees. Issues discussed in the UFMP can be used to educate the citizens about the value of trees to the community.

The UFMP will help raise citizen awareness of the benefits of a healthy, diverse and well-managed urban forest. A strong management plan will serve as a tool to be used for garnering public support, cooperation, funds, and help the community sustain its trees for future generations.

The objectives of the municipal tree plan include:

- Effective administration
- Annual analysis and removal of risk trees
- Proper tree selection and purchase
- Proper tree planting
- Proper tree maintenance
- Adequate funding
- Community education, participation, and collaboration

URBAN FOREST MANAGEMENT PLANNING

In natural forests trees in all stages of growth and decay are important to the functioning of the ecosystem, and even when left alone a forest will convey many benefits to humans. The same cannot be said of city and park trees. The term “City Trees” includes trees subjected to tough urban conditions including street and park trees and those planted along boulevards, in medians, in parking lots, in tree vaults, and other urban open spaces. Their health and vitality are compromised primarily through limited soil volume, compacted soils, restricted root space, and conflicts with other city infrastructure.

Other urban activities such as mowing, leaf collection, vehicle and pedestrian traffic, vandalism, and pollutants submit community trees to additional stresses. Intense citizen use necessitates pruning and prompt removal of high-risk trees to maintain high safety standards. A sustainable urban forest requires careful management in order to maximize the benefits of green infrastructure while addressing the direct and indirect human influences on the trees.

MANAGEMENT RECOMMENDATIONS

Community trees play an important role in the livability of the borough. The community draws a wide range of benefits from the trees. The urban forest has been recognized as a visual amenity and for its environmental benefits for several decades, but has only recently begun to be considered as a vital component of a community’s infrastructure, and given the specific label of “green infrastructure” or “natural capital” (e.g., Benedict

and McMahon 2002; Wilkie and Roach 2004; Ewing and Kostyack 2005). As a result, in Ketchikan as in many municipalities, resource allocation for management of urban trees has been relatively limited, and staff has largely been occupied with responding to emergency situations and service requests rather than having the opportunity to pursue more proactive management practices.

As with any type of infrastructure, the urban forest requires regular maintenance and monitoring to ensure that it continues to function properly and provide benefits to its maximum capacity. Infrastructure such as roads and sewers that are neglected for many years can only be repaired at a great cost to the borough and the people who live there. For the urban forest, this neglect typically comes in the form of failing to plant young trees to replace maturing populations, failing to adequately diversify tree species to protect against species-specific diseases, failing to prune trees early on to limit the risks posed by trees as they mature, and failing to maintain mature trees properly.

Fortunately in Ketchikan there are many opportunities to improve the urban forest through well-planned active management over time. This is one key area in which green infrastructure differs from built infrastructure; trees in cities, like other infrastructure, require maintenance to remain safe and viable but their value to the community generally increases over time as they mature so that they become less and not more of a liability.

The Ketchikan Gateway Borough, like so many communities, values its trees but has not, until recently, recognized that it should have a proactive, practical plan to ensure that the urban forest is managed to provide maximum benefits to the residents now and in the decades to come.

Management, maintenance and preservation of trees in the urban environment can only be achieved effectively through the development and implementation of a Strategic Urban Forest Management Plan that standardizes the policies and practices surrounding all activities related to trees. This report lays out the framework for and components of such a strategic plan, one that encompasses a long-term vision with short-term goals for the management of trees in the borough. It is up to the borough to provide the short and long-term support required to implement it. The goal is to provide specific guidance on managing, maintaining, and preserving trees within the urban and suburban infrastructure.

Employing the best management practices of the arboriculture and urban forestry industries, the following recommendations are for enhancing Ketchikan's community forest program. Community Forestry Consultants, Inc. recommends the following management and maintenance recommendations to improve the health, quality, size, and diversity of the working forest of Ketchikan. This section outlines the primary goals of this urban forest management plan.

PROGRAM PLANNING

The overall goal of strategic planning and management of the urban forest is to ensure a healthy, aesthetic, safe, and diversified tree cover that can provide a sustained supply of environmental, economic and social benefit to society. Research shows the average city tree lives only 32 years (Moll and Ebenreck 1989) and the closer to the city's center, the

shorter the life of the average tree. To help address issues like these, a long range plan is essential for management of a resource that is by its very nature a long-term matter.

Strategic plans define long-term and short-term goals for the agency's urban forestry program. Management plans define how individual goals are achieved through action plans and timelines. Each goal must have an achievable and discernable outcome. The outcomes are the policy that the agency wishes to have representing their program. Both types of plans can define the overall program management goals of the agency.

The objective of this report is to provide a framework for a Strategic Management Plan that will set the parameters for a standardized approach to urban forest management designed to promote the growth of healthy, functioning trees. The aim is to fulfill this vision over a five-year timeline.

Effective Administration

Like the gray infrastructure of streets and utilities, trees are an essential part of a community's green infrastructure and should be administered effectively. The responsibility for administering a community tree program must be clearly defined and carried out on a regular basis. These responsibilities often are divided among elected officials, a tree commission, and municipal employees in various departments.

The size and complexity of a municipality will determine how to organize the tree program. In a small community similar to Ketchikan, a tree board may have the entire responsibility. A large community may employ a city arborist or consulting arborist to coordinate work among a tree commission, municipal departments, and the public. Many variations of these organizational structures are possible. To ensure good program administration, the community should develop strategies that clearly assign responsibilities and define procedures.

Community tree plans provide overall guidance to the long-term administration of public trees, which then must be translated into effective actions. Annual work plans for tree removal, tree maintenance, tree planting, periodic inspections, task scheduling, securing funding, and public education and involvement should be used to schedule the work required to meet plan's objectives and goals. By using an annual work plan and a budget based on this plan to prioritize and schedule tasks for the upcoming year, a tree program can become more efficient and avoid crisis management.

Framework for the 5-year Strategic Management Plan (2010 – 2015)

The plan is intended to primarily provide guidance to the Public Works Department using a tree information database, in conjunction with a management cycle approach which will monitor short to long term trends and serve as a tool for proactive management of the various issues and factors affecting borough trees.

This plan is also intended to provide guidance for the ongoing education of and coordination with the various stakeholders with whom urban forestry staff must work for effective protection of the urban forest. This is intended to be an adaptive and "living" plan, creating a clear critical path for planning and activity, while still accommodating changes in priorities related to economic and/or environmental conditions.

Five-Year Management Plans

Five-year management plans are the first level of operational planning. The goals and objectives of strategic planning are incorporated into these plans as well as the immediate needs that are determined by reviewing the success or challenges of the previous five years of operations.

Each *5-year management plan* will outline objectives for the relevant period, which will direct the annual operating plans. Figure 2 illustrates the contextual structure and indicates the components that repeat throughout each plan (shaded). Those areas exist as a working document and will be revised accordingly based on the previous year's *5-year management plan* review; any revisions will be done in the fifth year of each plan.

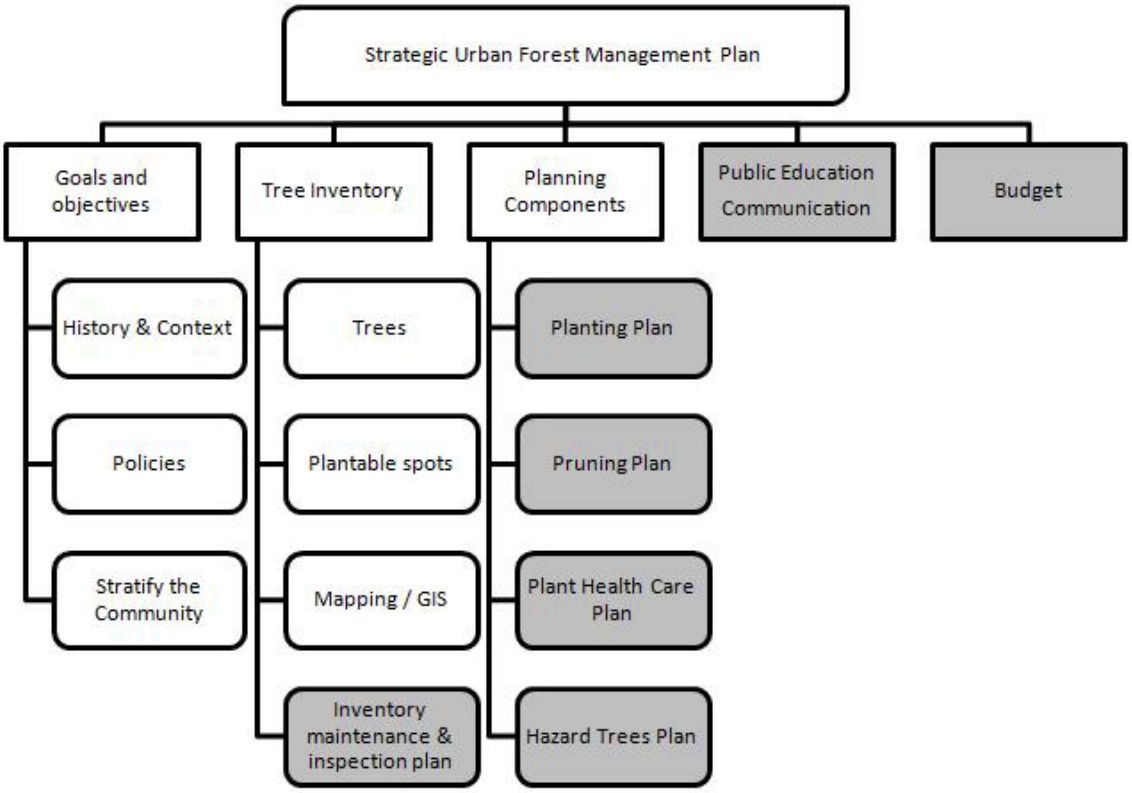


Figure 2: Contextual structure of the Strategic Urban Forest Management Plan (Bardekjian-Ambrosii).

Annual Operating Plans

Annual operating plans (AOP) will direct the day-to-day operations and can be used to project budget requirements for all aspects of maintaining the urban forest. The annual plan will include plans for planting, pruning, removals, inspections, plant health care and maintenance of the inventory. Initially, the annual plan will need to address priorities derived from the inventory, but eventually will be focused on proactive management objectives. The preparation of AOPs is the responsibility of the borough. An example is provided in Table 2.

PROGRAM ACTIVITY	J	F	M	A	M	J	J	A	S	O	N	D
PLANNING												
Work priorities												
Organize activities												
Modification												
TREE REMOVALS												
Review inventories												
Field inspections												
Conduct removals												
Permit inspections												
TREE PRUNING												
Review inventories												
Field inspections												
Conduct tree pruning												
Permit inspections												
TREE PLANTING												
Review inventories												
Survey neighborhoods												
Purchase trees												
Install trees												
Water trees												
Permit inspections												
COMMUNITY EDUCATION AND OUTREACH												
Education programs												
Arbor Day Festival												
Tree Board												
STAFF TRAINING												
Professional development												
Safety training												

Table 2 – Example of an Annual Work Plan

Communications Strategy

The communications strategy is comprised of three distinct but interrelated components that if effectively implemented and pursued on an ongoing basis will support the borough's overall community forest vision and mission. These components are: **(1) consultation, (2) education and engagement** and **(3) stewardship and hands-on involvement**, and are discussed in more detail below.

Effective implementation of this UFMP will require the "buy-in" and support from as broad a base as possible. This will include, but is not limited to: Borough staff (particularly those departments who need to work with, or around, trees), Assembly, Alaska DNR Community Forestry, local arborists, individuals, and groups involved in the

protection and restoration of Ketchikan's trees, private landowners, local green industries, and local institutions with trees on their properties or properties where trees could be planted.

Consultation: Once the strategic plan is complete, there will be a need to refine the goals and objectives through consultation with those considered key stakeholders in the development of a municipal urban forestry plan, as well as a need for periodic review of the status of the plan with these key stakeholders. The recommended components of the community consultations are described below, in order of priority:

- Soliciting community and key stakeholder input to establish *Five Year Plan* goals and objectives at the outset of the process.

- Creation of an urban forestry **citizen's advisory committee** to provide input to the *5-year management plans* on an ongoing basis.

- Conducting **public information sessions** to present the components and status of the five year management plans, provide updates on the plan's implementation over time, maintain interest, and solicit input.

The primary objective of the consultations process is to gather support and input from stakeholders who have been directly involved in the development of the strategic plan, as well as interested parties who have not. The second objective of this process is to monitor the successes and failures of the plan and to provide input into the adaptive management process. While unanimous agreement is usually not attainable, general consensus around key issues should be the objective of the various consultations. Where this is not attainable, the staff in charge of urban forestry will need to make decisions since they are ultimately the ones directing and managing the work being undertaken. A third objective of these consultations should be to point private landowners to resources (e.g., information, technical support), and possibly incentives, for planting and properly maintaining trees on their own property.

Ongoing consultations not only provide a mechanism for gathering input, but they are also a vehicle for engaging and sustaining the involvement of individuals and groups who can contribute to the plan's success. Community involvement in the urban forest is a primary instigator for the development of this study, and continued collaboration between various members of the community and the borough is essential for its success.

Of the three recommended components of community consultations, public information sessions is the only one that is to be undertaken strictly at the initial stages of the strategic planning process. Once a draft *Strategic Urban Forest Management Plan* has been developed, key stakeholders should have an opportunity to provide input to the plan's goals and objectives. This input could be solicited through facilitated group visioning sessions, from the borough's website, and through broader public information sessions. Representatives of the tree board should be specifically invited to such events.

The purpose of these events will be to capture key stakeholder and broader community input to the vision and goals for the UFMP, and provide an opportunity to create or re-establish relationships with individuals and groups interested in being involved with

ongoing implementation and review of the strategic plan. Results of these sessions should be documented and integrated into plan development.

Education and Engagement: Education is one of the best tools available to keep staff and citizens of Ketchikan informed of the benefits of trees and the proper care of trees. The citizens of Ketchikan have a strong sense of community and take an active interest in borough programs and projects. The community forest is linked to the people of the borough. Education and personal involvement of as many community members as possible is critical to the success of a sustainable community forest. Education about proper tree care and participation in the community tree program can translate into more tree benefits for the city and a willingness to support the tree program in the future. There are a variety of professionals in the region that can offer technical advice, literature, workshops, and other assistance.

The entire community benefits from an extensive, healthy and safe forest. Yet without an informed, involved populace, such a forest is difficult to attain. Individual trees require proper care in order to thrive, while the community forest as a whole, benefits from long-term planning. Community involvement is essential because of all that is required for quality care of the urban forest.

Stewardship: Support from elected officials and the citizens are critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the public and private community forests, and without greater political support and increased citizen understanding and commitment, urban forest management in Ketchikan may not reach its full potential.

With hundreds of visitors using Ketchikan's downtown district and parks at the height of the summer season, there are many opportunities to involve the community in the management of Ketchikan's trees. The parks are full of trees, not in the best condition, but trees are one reason why people use and enjoy Ketchikan parks.

Through a range of projects from increasing the potential for passive awareness (signs), to active recruitment for tree care through stewardship programs, the borough can continue to focus on bringing street and park trees, the benefits they provide and the maintenance needed to the attention of residents and patrons. Possible public involvement initiatives include the following:

- Utilize the tree board to provide an on-going opportunity for citizen input into the planning and implementation of the community tree program.
- Reach out to existing groups. Community groups such as the Audubon Society, Elks, Rotary, Chamber of Commerce, Lions, Future Farmers, 4-H, local garden clubs, and local businesses are usually very active and interested in community projects. Many of these groups would undoubtedly be interested in projects relating to forest health, and borough administrators should make an effort to reach out to them.
- Encourage environmental projects that benefit the street and park trees. Interns or summer teen employees from local high schools or colleges could be recruited and ensure that course credit or work study support is offered when they work on community trees. This benefits the community and strengthens ties to local schools.

- Offer a forum for community participation in park and street tree design decisions. Hold workshops for public input into planting decisions and street and park design.
- Use signage for education and increased awareness. Increase and improve signage around the parks, whether relating to tree species identification, self-guided tours, information on tree protection, and other useful and informative subjects.
- Develop a "Tree Walk" brochure for trees of Ketchikan that highlights the borough's most significant trees or new and unique species along with their natural and cultural requirements and history.
- Encourage stewardship. Promote a Stewards for Young Trees program within the community, setting up regular workshops for steward training and allowing civic or school groups to "adopt" newly planted trees (see Young Tree Maintenance).
- Link community needs to solutions provided by community trees. E.g. Stormwater abatement.
- Celebrate Arbor Week with a series of plantings at schools and parks hosted by elected officials.

Building a connection between citizens and street and park trees is the foundation for long-term stewardship and sustaining the community forest.

Urban Forestry Tree Board

The tree board is established in section 35.40 of borough code. The tree board purpose and duties are defined in the same section. The tree board is a very useful resource for busy borough staff working to develop and implement a management plan since it provides additional opinions from individuals who are interested in, and typically knowledgeable about, the subject at hand, and also helps maintain relationships with groups and individuals that may be able to assist with implementation.

The primary role behind an advisory board for the borough's UFMP, and the related *5-year Management Plans* would be to periodically (e.g., once a year) review the plans, and to track the status of the various recommendations. Tree committees can gain support for a tree program by involving the public in various important endeavors:

- Developing a community tree plan.
- Developing an annual work plan and budget for tree care.
- Designing tree plantings.
- Holding public hearings and reviewing permit requests.
- Soliciting funds, including grants and donations.
- Developing or reviewing a street tree ordinance.
- Organizing and coordinating Arbor Day celebrations, other events, and education programs.

The tree board should report to and be overseen by the staff member responsible for directing and overseeing the implementation of the UFMP.

MANAGING TREE RISK AND REDUCING MUNICIPAL LIABILITY

While most community trees cause few problems, there are situations that pose significant liability concerns. These include hazardous trees or limbs that could damage property and cause injuries or even death, trees that block required traffic sight lines, or tree roots that raise sidewalks or invade segmented pipes. In other states, the legislatures limit the amount of damages for which a municipality can be liable. Ultimately, however, a municipality has the responsibility for maintaining a safe public right-of-way once it has created one. The human and financial impact of these problems can far outweigh the costs that a municipality would have incurred in providing proper, proactive care.

The liability associated with trees can best be avoided by clearly assigning the responsibilities for tree inspection and care and then documenting that this responsibility is regularly met. Boroughs and other property owners are expected to conduct annual work, including yearly tree inspections, removal, pruning, and other maintenance. Some communities attempt to divert all liability of street trees to adjacent property owners while retaining regulatory authority over anything done to the trees. While this may reduce municipal costs, it does not entirely eliminate municipal liability for tree or branch failure. Because a municipality is responsible for a safe right-of-way, it is the opinion of some attorneys that a municipality cannot "hide" behind a street tree ordinance that makes it the duty of a homeowner to keep the right-of-way safe. At most, the property owner shares liability with the local government. Other communities choose to do nothing regarding their community trees, perhaps not realizing that inaction may not be a successful defense against negligence. The following strategies written into the tree plan or tree risk management plan can help reduce exposure to liability and strengthen a court case:

- A tree inventory will be completed and maintained. Dates of inspection, condition of inventoried trees, and pruning and other maintenance needs will be recorded.
- Annual inspections of community trees should be completed and accurate inspection records should be kept.
- Hazardous tree branches should be removed as they become known.
- Only trained, ISA certified, and insured tree care professionals who follow arboriculture industry practices should be hired for any tree maintenance work on public trees.
- Borough personnel will be trained in safe arboriculture procedures, first aid, and safe equipment use.
- Visual clearance for intersections, traffic signs, and signals shall be maintained.
- Requests by borough departments, property owners, and others should be responded to promptly.
- Implement a risk tree removal action plan based on levels of risk.
- Provide tree risk training for staff.
- Implement a cyclic pruning program.

Tree risk assessment can also be used as an educational tool to demonstrate the necessity for urban forest planning. With proper planting and aftercare combined with regular pruning and periodic inspections, there is less chance for weaknesses or defects to become hazardous. Proper management will lead to permanent reductions in liability.

The mitigation of high risk trees is an essential component of any municipal forestry program (Figure 3). A challenge for Ketchikan is to develop a comprehensive tree risk mitigation program that will increase the safety for the residents, Ketchikan Gateway Borough staff, and visitors to the community. Public safety is the major concern for urban forest managers.

The borough government has a legal duty to exercise reasonable care to protect the public from foreseeable risks. Borough managers, administrators, staff, and elected officials must demonstrate reasonable care to minimize the risk associated with trees in public areas. It is imperative for all borough departments to follow established risk management policies.

Figure 3 – City Park tree that has extensive basal and root decay. The tree is a risk to fail and located in areas of seasonal high use.

Risk Tree Abatement

Risk abatement of high risk trees includes inspection and evaluation of the trees, pruning and new tree plantings. To manage risk effectively communities must address difficult questions. While fear of liability may ultimately be the force driving the formation of risk management policy, professional assessment and correction of hazardous situations should be its foundation. The borough has collected most of its municipal tree inventory and tree maintenance requirements with TreeWorks™.

Once the inventory is completed, there will also be a need for the continued assessment of risk trees. Assuming that all trees with some risk factor will not be immediately removed, trees that are retained should be inspected on a scheduled basis. The determination of which trees should be inspected and how often should be part of the development of a tree risk program once the tree inventory is completed. Dedicated and qualified staff or consulting arborists will be required for tree inspections. Tree risk inspections should be performed by a PNW certified tree risk assessor.

With the initiation of cyclic pruning program, at a minimum, each tree will be re-inspected once every five years. Pruning crews will systematically work through the community and when they are assessing pruning needs they can also evaluate risks. Any new risks can be added to the database and then further inspections can be requested if required. Simple risk abatement through pruning can be addressed as part of the cyclic pruning program.

Once a tree has been identified as having a failure-prone defect and a target is present, there are a variety of approaches to managing the risk associated with that defect. In general, serious defects are more likely to be found in large trees than in small trees.

Recognizing that large trees with large canopies provide exponentially more benefits than small trees, efforts should be made to maintain large trees through techniques such as cabling, bracing, and corrective pruning rather than removing them. This will allow time for younger trees to develop the mature canopies that can maintain the stream of benefits for the community. Some of the most common approaches for hazard abatement are:

1. **Remove dead wood** - Trees with this recommendation have large pieces of deadwood over a sidewalk, road, front yard, trail or other high-use area. These large pieces of deadwood should be taken out of the trees before they fall out.

2. **Bracing and Cabling** – Bracing stabilizes larger tree components such as scaffold branches with included bark. Cabling of trees can be used to stabilize parts of the crown that could be prone to failure. Trees that have been cabled require a more-frequent inspection cycle. Generally, these trees should be inspected once a year to ensure the integrity of the cabling system and that the risk level of the tree has not changed.

3. **Crown reductions** – The aim of crown reductions is to shorten the height of tall crowns or to shorten the length of long horizontal limbs with too much weight at the ends. By reducing the length or the height, the safety of the pruned part will be increased. This prescription is used for older trees to try to keep them standing while new trees can be planted to replace them. Crown reduction cuts should be made back to a healthy side branch that is at least one-third the diameter of the reduced part. This may not always be possible for some trees and a smaller side branch may have to be

selected. It should be noted that for many older trees this is the last maintenance that can be performed before the tree is finally removed. Crown reductions are often undertaken in conjunction with cabling.

4. **Tree removal** – If there is no corrective action that can be taken then some trees will have to be removed. Risk reductions are best accomplished by reducing the number of poor quality species and eliminating high risk features such as trunk splits, trunk, basal and root decay and included bark crotches. By removing these species when the opportunity arises, the borough minimizes expenses by avoiding the greater cost of removal once the trees are in an advanced stage of structural decline.

The borough should develop specific guidelines for when and under what conditions trees may be removed. An ISA publication entitled "A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas" by Matheny and Clark is a source of information for risk management guidelines. The rating system used in the PNW-ISA TRACE course provides a numeric scale for rating tree risk.

The borough may wish to follow the criteria listed below for tree removals. The four situations in which tree removal are appropriate are

- if the tree is dead
- if the tree is irreversibly affected by disease or insects (particularly epidemic diseases such as spruce bark beetle) or in significant decline
- if the tree or tree parts represents a risk to fail (Figure 2)
- or if there is unavoidable conflict between tree(s) and construction.

Trees exhibiting high-risk external features such as death; cracks; splits; trunk, root or crown decay; included bark and other weak branch unions; poor tree architecture; and major crown dieback should be mitigated before the tree or parts of the tree fail.

The primary management priority for the borough in the short term is the reduction of high risk trees in public areas.

Tree Inspections

Currently the assessment of risk is the responsibility of city staff. The parks staff inspects trees drawn to their attention, reported by the public, or identified through operational activities. There is no systematic inspection process or trained staff available to identify trees at risk largely due to the current lack of staff training and resources.

Tree inspection is a systematic process of assessing the tree or parts for potential to fail and injure or for potential maintenance needs. The borough should answer these questions regarding tree inspections.

- Who is performing the inspections?
- Who is qualified to perform the inspections?
- What is to be inspected and in what area?
- What is the frequency of inspection?
- When should the inspections occur?

Inspections are the first line of defense in proactive risk management and maintenance programs. The borough can prioritize tree inspections and corrective actions needed based on a process that divides the borough into zones; establish inspection methods and schedules according to the zones; and implement corrective actions in a reasonable and timely manner. The evaluation cycle or inspection interval may be annually or two per year, one during the summer to include leaves and one during the dormant season. Mature trees and species with known failure histories may need to be inspected more frequently. Occurrence of tree or branch failures between inspections will indicate the adequacy of the interval between inspections. Additional inspections should be made following storm events.

The borough will benefit and reduce the possibility of structural defects being missed by using a certified tree risk assessor for tree inspections. Inspections should follow consistent protocol established by the arboriculture industry and described in this management plan; the problems should be documented and appropriate arboriculture recommendations made or future monitoring as necessary.

Taking a borough-wide tree inventory and implementing an urban forest management strategy creates an opportunity to develop a more comprehensive risk tree program to address the borough's responsibilities with respect to "duty of care". We recommend the following steps for the development of that plan:

- Contract for risk tree inspections by a PNW-ISA certified tree risk assessor qualification.
- Maintain and use the borough tree management software and tree inventory.
- Query the TreeWorks database to determine the numbers and locations of low, medium, and high risk trees.
- Determine an acceptable level of risk with input from certified tree risk assessor and decision-makers such as borough managers, assembly, mayor, legal department, risk manager, and others.
- Determine the staff and resources available to address tree risk issues.
- Develop a tree risk program and plan of action to mitigate risk trees.

These are the key points to consider. For a more comprehensive approach the borough should refer to a recent publication by the USDA Forest Service titled "Urban Tree Risk Management: A Community Guide to Program Design and Implementation". This publication is available at: http://www.na.fs.fed.us/spfo/pubs/uf/utrmm/.

MAINTENANCE

Pruning plans are essential, not only to ensure healthy, aesthetically pleasing trees but also to increase public safety and to decrease public or private liability. A variety of requirements can inform pruning plans, some more desirable than others. Common factors that determine pruning priorities are residential or business requests and emergency pruning. This kind of "reactive management" is most common in jurisdictions where no planning exists. Scheduling pruning based on these factors may actually increase liability for damages because many hazards remain unidentified until a failure occurs.

Healthy trees confer numerous benefits, yet poorly maintained trees can pose a considerable risk to the surrounding community. Broken branches and even entire trees can fall down, especially during inclement weather. In paved areas roots can cause cracks and buckles in pavement which may be tripping hazards. Leaves can clog gutters and fruits can rot and smell. While the benefits of trees far outweigh the costs, careful maintenance is needed to manage risks that are often predictable, detectable, and preventable. Excluding immediate, acute problems (blow downs, pest outbreaks, and extreme vandalism) tree maintenance should be performed following a two to five year pruning cycle based on a management plan developed by borough staff or consulting arborist.

Tree Pruning

As trees mature, branches grow and thrive while others naturally decline and die. In a natural forest, this branch dieback goes relatively unnoticed. In a municipal setting, safety and aesthetic concerns demand a higher level of maintenance. Young trees may need live wood removed or pruned to create a strong branching structure as the tree grows. Large dead branches must be pruned from a mature tree's canopy. Other branches may be pruned to preserve or create views.

Tree health can be greatly increased by regular pruning, especially when the tree is young. Immature trees that are not pruned can develop many structural problems such as weak branch structure, crossing branches, and co-dominant leaders (International Society of Arboriculture 2005). If corrected early, the tree can develop a strong support structure with a healthy canopy. This in turn will reduce the necessity of more expensive and often intrusive corrective pruning during the normal life of the tree. If tree condition is improved at a young age and maintained during the tree's life, there will be less need for a reactive approach to pruning.

Currently, tree issues are dealt with by the borough on a reactive basis. For the most part, crews respond to departmental or citizen requests that trees be pruned due to safety concerns. As this is not the most efficient or effective way to maintain tree health, we recommend the borough shift towards a more proactive approach to enhance the health of the urban forest, including both street trees and those located in parks. To develop an effective tree pruning program, the borough needs to build capacity to be able to prune all its public trees in a systematic manner as well as responding to emergency pruning and safety concerns in good time. Emergency response must be coordinated with other emergency response planning.

Most communities try to implement a two to five year pruning cycle. The ability to implement a cyclic pruning program is limited by the staff and financial resources of the borough and most cities and towns cannot afford to contract services for all trees. There are options available to deal with budget constraints. For example, contract pruning of trees with diameters larger than 16 inches near high use areas may be an initial management recommendation while small tree pruning is performed by borough staff or trained volunteers. The objective is to start and maintain a cyclic pruning program within the fiscal and personnel resource constraints of the borough.

Industry standards such as ANSI 300, 133.1, or 60.1 define the standards and terms of arboriculture; specifications and best management practices determine how the agency applies the standards to manage its trees. The standards and specifications are applied universally to all public trees regardless of who is doing the work – staff or contractor.

The standards and specifications guarantee that, if invoked, a healthy, structural sound urban forest will be perpetuated. The standards and specifications also demonstrate the agency is implementing currently accepted practices by the urban forestry and arboriculture professions. The arboriculture specifications should, at a minimum, include specifications for removal, pruning, planting, species, tree preservation, risk rating system and inventory methodology.

Pruning treatments should follow the best management practices established by the ISA, ANSI Z133.1 and ANSI A300 standards and employ ISA certified arborists or certified tree workers to perform tree maintenance. In addition to ANSI standards, the borough should develop pruning specifications that serve to define treatments for different species, ages of trees, pruning techniques and other pruning issues.

Proper pruning adds value to the landscape and is one of the few active management techniques that helps a landscape appreciate in value while minimizing liability concerns. Proper pruning, with an understanding of tree biology, can maintain good tree health and structure while enhancing the aesthetic and economic value the community forest creates for Ketchikan.

Mature Tree Care

The benefits and values of trees are maximized when trees reach maturity and become established in their growing location. To maintain this high level of benefits for a longer period, the borough should commit to providing regular scheduled maintenance to its mature trees and prepare for other, non-routine arboricultural treatments as needed. A comprehensive mature tree care program primarily centers on routine or preventive pruning, and the ability to provide fertilization, irrigation, insect and disease control, and cabling and bracing when necessary.

Routine pruning should occur on a cyclical basis for the entire tree population once all priority maintenance removal and pruning activities have been completed. If funds do not exist, the routine pruning program can begin after the priority tasks have been completed. This activity is extremely beneficial for the overall health and longevity of street and park trees. Through routine pruning, potentially serious problems can be avoided because the trees can be closely inspected during these pruning cycles. Proper decisions can be made on declining trees, and any trees that become potential hazards can be managed appropriately before any serious incidents occur.

If regular pruning is planned in a systematic manner, crews and equipment can work much more efficiently than if pruning is only done by request. The cost difference can be dramatic. The ISA has compared efficiencies of both methods and found planned pruning to be at least twice as productive. When crews examine the urban forest regularly for possible risks and tree health problems, there is a reduction in citizen calls for emergency pruning (Luley et al. 2002). Additionally, the crews often find problems that would not have been reported by residents. Regular pruning cycles can also focus on certain species that may require more attention; this is common when a pest needs to be controlled, for example. Regular, cyclic pruning maintains a greater safety level in the urban forest and can decrease liability for the municipality (McGauley et al 2000).

A regular pruning cycle is a critical component of an effective community forestry program (Table 3). Regular pruning of the borough's trees will improve the condition

rating of a large number of trees, reduce the potential for storm damage to trees, reduce the risk associated with community trees and demonstrates proactive management of the borough's tree resources (Table 4).

Young Tree Pruning Program

There are newly planted or young trees in Ketchikan. More new trees will be added as high-risk trees are removed and to diversify the existing tree population. It is critical then to understand the proper maintenance techniques required to ensure the longest and safest service life of these trees. The major components of a young tree care program are pruning, mulching, and watering.

Figure 4 – Mature tree in City Park with co-dominant stems. Proper pruning when the tree was young could have easily prevented this condition.

Training pruning is used to develop a strong structural architecture of branches so that future growth will lead to a dominant central leader, strong branch attachment and proper branch spacing along the trunk. It also consists of the removal of dead, dying, diseased, interfering, conflicting, and/or weak branches.

Many young trees may have branch structure that can lead to potential problems as they grow, such as double leaders, many limbs attaching at the same point on the trunk, or crossing/interfering limbs. When trees are small, these problems can be remedied easily and inexpensively.

If structural problems are not corrected while trees are young, they can lead to poor branch attachment (Figure 4). Trees with poor branch attachment can become safety risks as they grow larger and could create potential liability for Ketchikan in the near future.

All newly planted trees should receive their first training pruning the third year following planting. Training pruning should not be done when a tree is planted, because it is already under stress from transplanting and needs as much of its leaf canopy as possible in order to manufacture food and increase root growth for proper establishment in its new site. Only dead or broken branches should be removed at the time of planting, and in the next two years.

The training pruning program would also be accomplished on a cyclical basis, but the work would be scheduled during a three year cycle rather than the two to five year cycle for the routine pruning of larger established trees. As mentioned above, newly planted trees should receive their first training pruning three years after planting. This work can be accomplished throughout the year.

Proper training in young tree structural pruning would be required for Ketchikan staff or volunteers responsible for this task. Additionally, these workers would require an understanding of the growth-habits of the various species being planted, as well as an understanding of tree biology, anatomy and physiology.

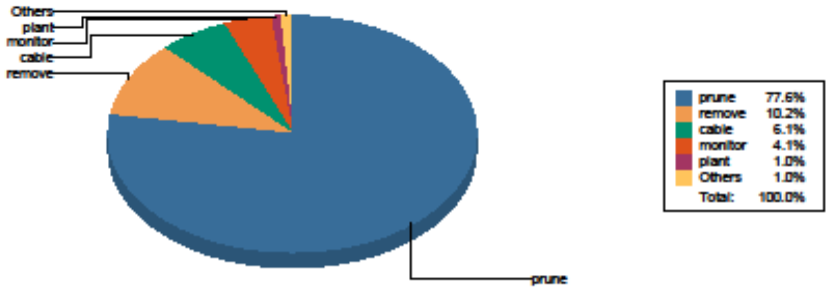
This type of work is also highly suitable for properly trained summer interns, part-time employees, and/or volunteers. Since no bucket truck is required, borough staff or volunteers can perform this work at any time. Training pruning can be accomplished from the ground with a minimum amount of equipment. The borough should develop an organized, documented approach to cyclical tree maintenance that can be easily managed by borough staff and properly trained volunteers, if budgetary issues are a concern.

An optimum time to perform this pruning is late winter–early spring prior to bud break. The leaves are gone allowing clear visibility of the branches and trees will react positively to pruning at this time of year. Also it is usually a time of the year when borough work loads are less demanding.

Maintenance requirements and condition of trees found during inventory data collection are summarized in the following charts.

Planned Maintenance

Report universe: All ☒ Subset ☐ From: 1/1/2008 to 1/15/2010

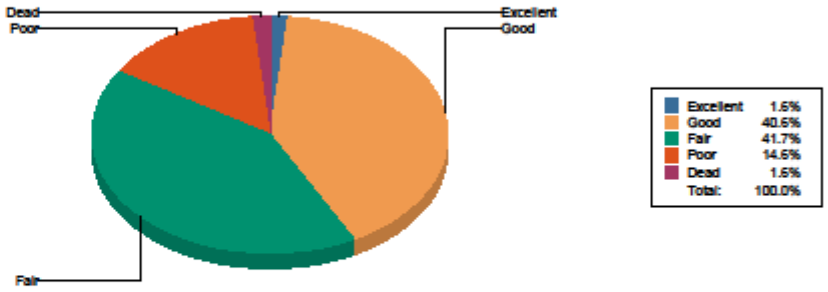


Task	Count	Percent
prune	76	77.6%
remove	10	10.2%
cable	6	6.1%
monitor	4	4.1%
plant	1	1.0%
stump removl	1	1.0%
Total	**98**	

Table 3 – Tree maintenance tasks and task frequency determined during inventory data collection.

Condition Distribution

Report universe: All [X] Subset [ ]



Top 20 Species

Condition	Percent	Count
Excellent (81 -100)	1.6%	3
Good (61 - 80)	40.6%	78
Fair (41 - 80)	41.7%	80
Poor (21 - 40)	14.6%	28
Dead (0)	1.6%	3
Total		**192**

Table 4 – Condition ratings for inventoried trees.

PLANTING

Tree Planting Plan

There is a clear need for a tree planting plan to guide the arboriculture future of Ketchikan's community trees. Such plans will minimize the unintended but gradual degradation of the urban forest over time, as well as maximize the potential for a sustainable and diversified tree canopy and the associated benefits. The trees in Ketchikan—a relatively young, even-aged, limited, and undiversified population—are not only significant design elements but also represent the future canopy cover at this stage in their growth.

For every dollar spent on tree planting and establishment, a 250% return on investment is provided back to the city in terms of the total services provided at tree maturity.

A challenge for the borough is to plant enough new and replacement trees each year to increase the canopy cover. Without a clear plan to guide tree plantings, the borough may gain trees but not achieve a net increase in tree canopy.

Tree planting plans include input from local citizens, state agencies, organizations, businesses, borough staff, affiliated green industry professionals, and elected officials. They are integrated with other comprehensive agency plans and create a blueprint for administration and management of the street and park tree planting program.

The goal is to provide specific guidelines on locating, planting, and caring for trees within the urban and urban/rural interface. **Removing, pruning, planting, and preserving trees; educating stakeholders; and improving coordination and communication among citizens, tree committee, borough staff, and elected officials are critical components in the development of the tree planting plan.** A tree planting plan will help department managers quickly determine how best to apply funding that often becomes available in small and unpredictable amounts. A plan should not only specify what (species) and where (location) but when (timeframe) and why (underlying goals).

Implementing a tree planting plan and using inventory data to prioritize planting and maintenance establishes a systematic program which actually reduces costs. This is primarily because systematic maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high risk trees. A healthy and well maintained forest does not come about by accident. The health and stability of Ketchikan's trees can only be achieved through careful planning and systematic maintenance of the tree population. Maintenance practices and standards for new tree plantings should be a component of the tree landscaping plan as well as strategies for funding maintenance programs. Developers should be encouraged and expected to use creative design strategies to achieve the intent of the tree planting plan.

Tree planting in a city can significantly impact that community's landscape for years to come. Yet planting decisions, including the selection of species and location, are often made without the benefit of a long-term strategy or plan. Tree planting might occur as part of a larger capital construction project, or be driven by a donor request or the need for a volunteer project. Each of these common scenarios can occur in Ketchikan—as it has in many cities and towns—over the years.

Current community values are an important consideration in the tree planting plan. It is important to consider the values of residents and department managers in the decision making process. Greater collaboration and dialogue can often result in a greater consensus for a given set of actions, with the result that the urban forest has a better chance of thriving. The locations, types of trees (flowering, evergreen, deciduous), and underlying urban forest goals should all be discussed in this process.

The tree planting plan document defines the long-term direction the borough will take to develop a diverse and appropriate tree population and the choice of species the borough intends to plant. The importance of a planting plan as an element of a tree program is that it demonstrates a policy that, over time will reduce the planting of high risk trees, increase the planting of high-quality, low risk trees, diversify the species population, and place trees more appropriately in the landscape. The infrastructure constraints of every street and park are also defined to guarantee that tree health and structure are optimized over the life of the tree.

As the inventory of existing trees continues, places where trees could be planted should also be noted. These sites are potential spots where the urban forest can be enhanced

and where the first possibilities lie for increasing the number of trees in the community. Knowing the number of available planting sites can also help when the community is budgeting for, and ordering new trees.

The community tree plan should address some important questions about landscape design, including the kinds of neighborhood and other landscapes that are present, their function, and their attractiveness; how the landscapes should look and function in the future; and how the landscapes should be protected or modified to create the desired result. Design strategies can include the following:

- Important landscapes, such as business districts, neighborhoods, and main entrances and exits, will be identified and considered in tree and flower planting.
- Traditional landscapes, such as neighborhoods with large trees, will be preserved through tree planting. An overall image of the borough will be developed through the coherent planting of trees along streets.
- The final selection of trees and their placement for a landscape shall be made in the field while considering the many elements of that landscape.
- The tree species chosen for planting, besides meeting design criteria, must be biologically adapted to site conditions and well suited for the level of care it will receive.

The opportunity to plant trees exists in every park and on every street. Each year communities are transformed by planting tens of thousands of trees in parks, landscapes and along city streets. It is a common activity promoted by cities, local and national trade, and professional and citizen organizations. These new trees are the future environmental, economic and social workhorses for our communities.

Figure 5 – Trees planted too deeply in Whale Park.

An annual planting program will maintain a healthy and sustainable community forest. A comprehensive planting plan that identifies the planting needs throughout the borough should be developed. The plan will provide a systematic means and criteria for consistent direction to determine types and frequencies of tree plantings. The plan should include available planting spaces, recommended species, planting specifications and maintenance requirements for new trees. The ultimate mature size of trees should be considered when selecting species planted near buildings, utilities, monuments and active recreation areas. Trees can impact these built features both positively and negatively through shading, dropping

flowers or fruits and framing. The key to maintaining a healthy, sustainable community forest is the implementation of regular, annual tree plantings, regardless of grant money or catastrophic events. A large number of trees do not need be planted, but a consistent annual addition of trees to the community forest is critical to maintain a perpetual canopy. **The annual quantity of trees to plant is directly dependent on the quantity of trees the borough can maintain.**

Tree Planting Practices

Across the country we are striving to restore our community forests but the road from nursery to working forest is arduous. The sight of new trees struggling rather than thriving in the landscape is common whether the site is residential or commercial, public or private.

The current installation practices used in Ketchikan are planting trees too deeply. Root collars are buried and trees are dying or declining rather than thriving. Installation practices need to change to reduce mortality and increase longevity at the outset (Figure 5).

In general, the tree-planting holes should be relatively shallow (typically slightly less deep than the measurement between the root collar and the bottom of the root plate) and quite wide (three to five times the diameter of the root system). Care should be taken so that the root collars of the new trees are at the same level or slightly higher than the surrounding soil grade (Figure 6).

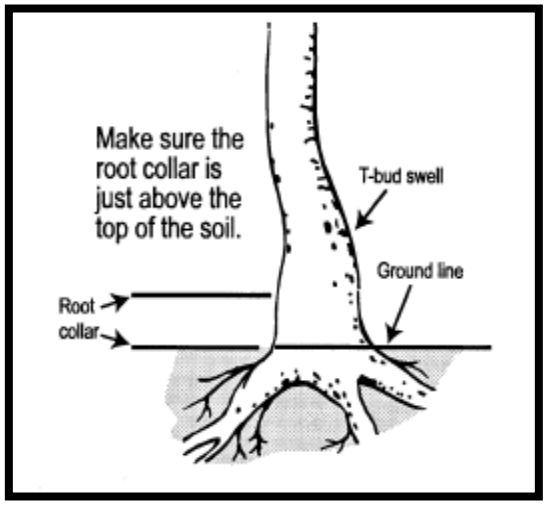


Figure 6 – Root collar at grade level

In most situations, it is not recommended to add soil amendments to the planting holes, as this can lead to differences between texture and structure of soils inside the planting holes and the surrounding soil. Such differences can lead to either water being wicked away from or accumulating in the planting holes.

Tree staking or guying should be the exception and not the rule. Tree staking hardware should only be installed when necessary to keep trees from leaning (*e.g.,* windy sites) or to prevent damage from pedestrians and/or vandals. Stakes should only be attached to trees with a loose, flexible material, and all staking material must be removed as soon as the root system anchors the tree.

Bare rooting, or the removal of field soil or container substrate, at planting and transplanting has many advantages that can address the above mentioned structural root depth and defective root system problems. Bare rooting also has advantages relative to other production, harvesting, shipping, and planting and transplanting components, with the following being a compilation of the major advantages across all phases of plant handling:

- Root defects and structural root depth can be corrected prior to tree harvest if bare rooting occurs during each propagation or production stage, or during planting or transplanting.
- Root pruning stimulates new root growth.
- Field soil and container substrate can be retained at the production nursery.
- Transmission or transport of soil-borne weeds, insects, and pathogens can be minimized.
- May help in dealing with quarantines relative to soil-borne insects and pathogens.
- Trees may be less expensive and easier to store at the nursery prior to shipping.
- Trees will be less expensive to ship and therefore potentially less expensive to the buyer.
- Trees can be transported into more confined spaces if both their branches and their roots can be compressed.
- Trees will be easier to handle because they weigh less.
- Planting holes will be easier to dig and will require less heavy digging equipment (with a side advantage of reduced soil compaction).
- Removes problems that can result from incorrect installation handling of balling burlap, ropes, and straps, and wire baskets.
- Resolves soil and container substrate disparity or hydrologic discontinuity problems.
- Root systems are more uniformly moistened by “mudding in” (creating a soil slurry to settle into and atop the bare root system), and large air pockets are removed.
- All structural and absorbing roots are in contact with the planting site soil, not just the roots/root tips on the outside of the root ball.
- “Mudding in” creates greater direct root to soil contact and reduces the need for supplemental stabilization (staking or root anchoring). This in turn reduces maintenance cost and potential tree and human hazards when no stabilization method needs to be removed.
- Fewer injuries should occur to green industry personnel.
- Potential to increase the period of time of the tree guarantee or warranty.
- Trees with poor quality roots can be refused or returned with proof of the structural defect or root depth problem.

An additional, non-production or installation advantage noted by the author when employed as a municipal arborist was increased volunteer participation in tree planting activities due to the lighter weight, more consumer friendly bare root tree.

Mulching

Mulch should be applied to the surface of the soil around each newly planted tree. Mulch should never be piled up around the root collar (creating mulch volcanoes), but rather should be pulled away from the root collar (Figure 7). Mulch that buries the root collar provides shelter for insects, fungi, and mammals that could damage the tree. Mulch should be applied to an area three times the diameter of the root system to a depth of two to four inches. Mulch not only suppresses competition from grass and weeds, but also provides a zone where turf maintenance is not needed, thereby keeping lawn mowers and string trimmers safely away and thus preventing mechanical damage.

Mulch also helps to hold moisture in the surface of the soil where most of the feeder roots are to be established.

Diversification

The 2009 inventory of selected street and park trees included over 200 trees. Trees in parks (City Park, Alder Park, and Whale Park) and trees in the public right-of-way were included in the data collection. There are more than 20 different species found in the tree population (Table 5).

This appears to be a diverse population but species distribution figures indicate the population is dominated by a few species. Over 60 percent of the tree species are represented by four species. The four species are red alder, mountain ash, western hemlock, and sitka spruce.

Figure 7 - Incorrect mulch applications can degrade trunk tissue causing tree mortality.

Species diversity in new plantings should be a primary concern. The dangers (*e.g.*, disease and insects) of planting monocultures have proven to be devastating throughout the United States. The goal should be to maintain species diversity throughout the borough. A common guideline for maintaining species diversity in urban settings is the 10-20-30 rule. That is, no one species should make up more than 10 percent of the trees in a population, no more than 20 percent of any one genus, and no more than 30 percent of one family in the total tree population (Santamour, 1990). When planning the expansion of the community forest, the borough should use this ratio as a guiding principle.

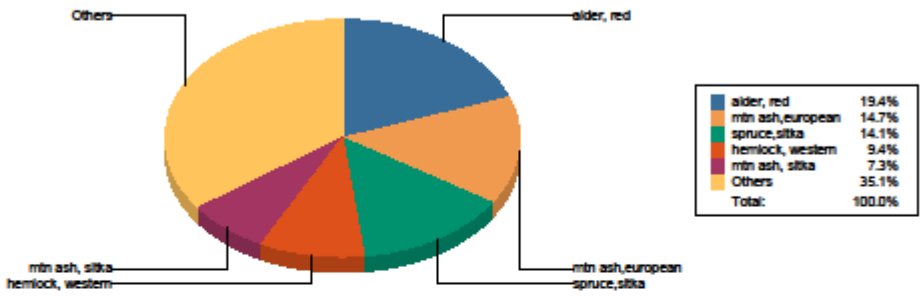
The borough should emphasize a diversity of species in the planting program. Many species should be avoided that have high maintenance costs, invasive characteristics, high storm damage potential or a history of failure.

Different species offer different amenities for the borough and parks. Some trees grow very large and provide a great deal of shade, others grow tall and narrow, and still others remain small. Some trees flower profusely (“showy ornamentals”), others have tiny, almost invisible flowers. Some trees stay green year round; others drop their leaves in the fall. Trees may attract birds and insects by providing food or habitat. There are very rare species which can become “specimen species” in a park or along a city street. New landscape plans should consider a balance of all these offerings. Biological and environmental site characteristics, maintenance needs, historic plantings, staff and community input should be considered in the landscape planning process.

Diversity is an important measure of a forest’s resilience. A more diverse forest, both in total number of species represented and in their relative abundance, is better able to adapt to environmental changes as well as disease and insect infestations. When just a few species dominate the composition of a tree population, these changes or infestations will significantly impact the entire population.

Species Distribution

Report universe: All ☒ Subset ☐



Top 20 Species

Species	Percent	Count
alder, red	19.4%	37
mtn ash,european	14.7%	28
spruce,sitka	14.1%	27
hemlock, western	9.4%	18
mtn ash, sitka	7.3%	14
pine,lodgepole	4.7%	9
cedar,western red	4.2%	8
mapl,japanese	3.7%	7
mapl,vine	3.7%	7
mapl,freeman	2.6%	5
mapl,norway	2.1%	4
birch,paper	1.6%	3
hemlock,mountain	1.0%	2
mapl,red	1.0%	2
cherry	0.5%	1
cherry,sargent	0.5%	1
crabapple spp	0.5%	1
cypress, hinoki	0.5%	1
dawn redwood	0.5%	1
elderberry	0.5%	1
Others_	7.3%	14
Total		**191**

Table 5 – Species distribution. Over 60% of the public tree population is represented by four species.

Diameter Distribution

The graph below depicts the diameter distribution for the majority of borough trees inventoried. A population exhibiting the diameter distribution characteristics would indicate the borough had planted trees in the recent past, say ten to thirty years ago, but now interest in planting the species has waned.

The optimum diameter distribution for trees considered for retention in the population has the largest number of trees in the smallest diameter classes. As each group of trees within a specific diameter class matures, the numbers within the group diminish through attrition. To perpetuate a specific species, the largest representation must be in the smaller diameter classes. Generally, for any given species, twice as many trees need to be planted as are removed in any one year in order to maintain the exponential shape of this graph. Species that the borough wants to preserve in perpetuity should mimic the ideal diameter distribution.

A well distributed age-class helps maintain a stable canopy cover. If all the trees within a particular area or neighborhood are approximately the same age they will mature and decline more or less at the same time, leaving that area with a deficient urban forest canopy. In many parts of the borough, young trees of similar age class dominate the landscape. To mitigate the impacts of an even age canopy maturing at the same time, the borough should take steps to increase the age class and species distribution where possible.

For example, the City of Davis, CA established the following standard for desired age structure:

- 40% young (< 6 inch DBH)
- 30% maturing (6 – 12 inch DBH)
- 20% mature (12 – 24 inch DBH)
- 10% old (> 24 inch DBH)

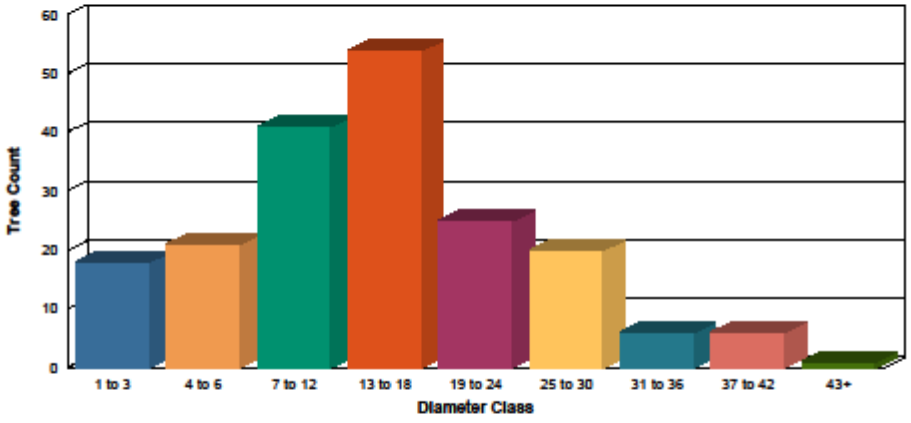
Ketchikan's population ranges for the same categories of desired age structure are:

- 20% young (< 6 inch DBH)
- 20% maturing (6 – 12 inch DBH)
- 40% mature (12 – 24 inch DBH)
- 20% old (> 24 inch DBH)

Management activities should strive to improve Ketchikan's population distribution to reflect current industry standards.

Diameter Distribution

Report universe: All ☒ Subset ☐



Diameter Class	Percent	Count
1 to 3	9.4%	18
4 to 6	10.9%	21
7 to 12	21.4%	41
13 to 18	28.1%	54
19 to 24	13.0%	25
25 to 30	10.4%	20
31 to 36	3.1%	6
37 to 42	3.1%	6
43+	0.5%	1
Total		192

Table 6 – Diameter distribution of inventoried trees (Diameter breast height – 54 inches above grade level).

RECYCLING WOOD WASTE AND CHIP DISPOSAL

Tree removal is typically the most expensive tree maintenance operation on a per tree basis. Other costs associated with tree removal include stump removal and wood waste disposal.

The wood generated from tree removals brings little economic return to tree management budget. The growing concern about the environment and over burdened landfills, coupled with an opportunity to augment the forestry budget, should prompt the borough to the possibility of processing waste wood as a revenue generating activity.

There are many opportunities today to recycle tree residue. The following options are available for agency use.

- Mulch (new tree installation, trails, landscape beds)
- Biomass fuel production

- Small scale sawmill operators (building materials)
- Secondary product production (park benches, furniture, wood sculptures)
- Woodworker associations (knotted and twisted wood pieces)
- Composting
- Firewood

Which option(s) to apply and implement will depend on borough laws, agency policies and resources. An internal review and revisions of existing laws and policies governing agency wood waste utilization can improve the agency's ability to sell this material (USDA, NA-TP-02-94).

TREE PROTECTION

The primary goal of tree protection is the long-term survival and stability of a tree or group of trees. It is not about trying to save every tree during development and construction because some trees are not salvageable due to structural problems or poor quality species. It is about preserving and protecting trees that add value to the property or because the community demands trees be preserved and protected.

Arboriculture practices cannot repair construction damage or vandalism to a tree or reverse degradation of its growing environment. Our industry has a limited ability to cure these injuries or accumulated stresses to trees. The focus to reach our goal of tree protection is to prevent injury to trees.

Construction Protection

Construction in and around trees can lead to chemical and physical injury to tree trunks, soil compaction in the root zone, severed roots, smothered roots, split or broken branches, and new exposure to the wind and sun. Construction injury to trees is often an accumulative effect of several activities that stress the tree. The injury may not manifest itself in the tree until years after the injury occurred. When construction is necessary it is important for everyone involved in designing, contracting, and managing a project to understand tree preservation and to use best practices in tree protection. The best way to protect trees from construction damage is to prevent damage to the tree and the surrounding soil. Identify arboriculture treatments such as pruning, irrigation, fertilization, mulching, and pest management that may be needed prior to construction activities and to invigorate trees (Matheny and Clark, 1998).

A tree protection zone should be established and fenced off and contractors should be prohibited from moving or working within the fences. In order to prevent soil compaction and root injury, the fence should be placed at least as wide as the tree canopy's drip line but often wider. If the rooting area cannot be off limits, mulch the soil under the tree canopy heavily to reduce compaction.

Driving near trees should be minimized; site access and equipment storage areas should be clearly delineated prior to the start of construction. Trenching near trees should be eliminated and trees should be protected from physical mechanical damage with tree wrap or tree guard.

Monitor trees during construction to evaluate and treat any damage or change in health to trees that occur and to document any conditions that result from construction damage. If trees are injured during construction they should be tended to immediately.

Vandalism

It is impossible to constantly police every street and park tree. It is possible, however, to raise awareness in the community about tree health and to increase people's respect for the trees in the community. Educating residents, park patrons, and school children about street trees or trees in the parks may reduce incidents of tree vandalism (such as girdling and peeling bark, and harvesting bark) and encourage reporting of observed tree damage.

Accidental tree damage is also primarily a matter of education. Most people do not realize that slamming a car door (or fender) into a tree, urinating on a tree, hammering a nail into a trunk, or dumping hot coals at the base of a tree may all cause irreparable damage that can eventually lead to hazardous conditions and tree mortality. Even walking on a tree's roots, when done by hundreds of people a day, can seriously injure a tree.

Programs that raise the public's awareness of the trees in the community through emphasizing their benefits they provide can help influence resident and visitor behavior. See the education and outreach sections of this UFMP for more information on this topic.

Young Tree Protection

As more young trees are planted along streets or in the parks, the need for a young tree maintenance program will rise. Young trees require more frequent care than older trees. Depending on conditions they may need to be watered, mulched, pruned, and/or protected with temporary fencing, as they are more susceptible to vandalism and adverse environmental conditions.

Trunk protectors used during the winter season will avoid damage from smaller rodents and beaver. It is worth the investment, as a year's worth of new tree planting losses from small animals can quickly exceed the cost of fencing, trunk protectors, maintenance, and upkeep. Planting larger caliper trees from the onset may alleviate some problems with animals or vandalism.

Encourage volunteers to adopt young trees in the parks and their neighborhood. Volunteers trained in basic tree maintenance, and watering techniques, provided with tools (a hose, trowels, garbage bags, gloves, etc.) and are given the responsibility for the care of the adopted tree. This program promotes citizen involvement in tree care and awareness of the urban forest. This program could be implemented in Ketchikan for street or park trees – individuals, families, or school groups could adopt newly planted trees. The borough should attempt to organize a 'Tree Stewards' program and utilize the opportunity this group provides for more volunteer hours.

MANAGEMENT INFORMATION

The inventory and management plan is a starting point for continued active management of the working forest resource of Ketchikan. The comprehensive nature of this management plan is intended to serve as a baseline for future data collection and management plans. By carefully documenting changes in the forest structure (plantings, removals, pruning operations, incidents of vandalism, etc.) the borough will be able to assess the success of the program over time. To assist in the future implementation of

the UFMP and development of the urban forestry program, a complete inventory of public trees is needed. Critical areas in the borough and borough park trees were inventoried. The borough needs to keep the inventory current and accurate using TreeWorks™, an ArcGIS tree management software.

Tree Inventory

Fundamental to a tree management program is the inventory. Tree inventories are the foundation of an effective tree management program. Tree inventories help vegetation managers identify current and potential problems and plan for budgets, removals, pruning, planting and other maintenance requirements. A tree inventory is a means by which a vegetation manager can acquire and retain pertinent information about the condition and value of Ketchikan's tree resources. The inventory data supplies objective and quantitative information that can be used to document estimates for funding, personnel and equipment. The tree inventory moves the urban forestry program into proactive management.

A complete assessment of the tree population is necessary to obtain accurate, functional data necessary to manage the urban forestry program.

Completing the tree inventory and using TreeWorks™ to prioritize maintenance establishes a systematic tree maintenance program which actually reduces costs. This is primarily because systematic maintenance in general leads to healthier trees that require less expensive maintenance over the long run than unhealthy, high-risk trees. A computerized tree inventory aids in reducing the subjectivity of tree management decisions and stimulates proactive responses.

Data Use and Tree Analysis

TreeWorks™ can be used to refine inspection procedures, aid in reducing the subjectivity of tree management decisions, stimulate proactive responses, track maintenance, and guarantees problematic trees are visited regularly. TreeWorks™ tree management software can supply the tree manager with data tables, reports, maps, and work orders to be used for removal schedules, service requests, project bidding, contract reports, and other tree management functions. The tree management software is an effective, efficient day-to-day and long-range management tool.

A good forest management program should exist outside of the individuals who apply it. Trees typically live far longer than humans do and certainly longer than the average human career-span. As a result, urban forest managers should consider the long-term consequences of their data management, and should record forest changes with the understanding that the information may be useful decades from now.

The inventory data can serve to educate citizens and increase their participation in stewardship programs by providing access to the data for school science projects, planting projects and other public tree activities. Staff can present quantifiable data to borough administration and assembly for justification of program activities and budgets.

ORDINANCE REVIEW

In recognition of the many benefits conferred by trees, hundreds of local governments are adopting street and park tree ordinances. Street and park tree ordinances apply mostly to publicly owned trees, as well as nuisance trees on private property.

Ordinances are regulations enacted by government for the benefit of the community or citizens and when dealing with trees are usually tree ordinances. Ordinances define the legal interaction between the public, the agency, and its trees. They define what a private individual can and cannot do to a public owned tree.

Street tree ordinances authorize and regulate a street tree program. Some ordinances apply only to street trees, while others include park and other public trees. Tree ordinances can:

- legalize a tree program through authorization of a tree commission;
- establish a permit review, approval, and appeal process for tree removal, planting, and pruning;
- specify and ordinate arboriculture standards for tree planting, pruning, and other tree work; and
- ensure that the people who perform work on the trees are well qualified.

Street and park tree ordinances must resolve two key issues. First, the ordinance should identify local government (and private property owner, if desired) responsibilities for planting, pruning, removing, and maintaining trees. Second, the ordinance should establish a tree committee and provide the committee with authority to guide the management of public street and park trees.

The borough code contains very few components of a tree ordinance. Borough code section 35.40 establishes the tree committee and its authority. Section 70.45 addresses bans on tree planting near underground utilities and bans removal of any public tree without permission. There are no other sections of the borough code that specifically address tree issues. These components do not address trees in the public right-of-way or street trees.

The borough code lacks provisions recommended and found in other city tree ordinances. To ensure that public trees will be properly cared for, street tree ordinances usually contain most or all of the sections listed below. The comments and examples are intended to help in revising the borough tree ordinance. Municipalities should understand and plan for their own particular needs and abilities and not rely only on model ordinances from other places. The common elements and a brief description of each element follow on page 45 in Table seven. Table eight on page 46 shows the common elements in selected ordinances from other cities in the Northwest United States.

The following additions or revisions are examples of proposed revisions and additions:

1. The code lacks a purpose section. It does not clearly state the mission and objectives of the urban forestry program or the program ordinance. It does not mention the intent of the ordinance is to address public tree management. A purpose section defines the intent and objectives of the ordinance.

2. The definitions section should be expanded to include definitions for industry terms such as species, pruning or street tree and public terms such as right-of-way or planting strip. The definition section needs expansion to cover more industry terms not familiar to the public.
3. A recommended species list and a prohibited species list section should be referred to by a document name to clarify the use and ability to update the list as industry planting standards and specifications change.
4. There are no sections that refer to permit requirements for tree maintenance activities. These sections could be consolidated into one section that clarifies the permit process for all public tree maintenance activities.
5. The ordinance should be expanded to include other pest infestations or disease infections that are considered incurable and epidemic such as spruce bark beetle. Severe maintenance treatments such as topping may be included in this section.
6. A tree ordinance provides an opportunity to establish policy and back it with force of law if necessary. The infraction and damages section should address mutilation, damage, vandalism, illegal removals and improper pruning, etc. Penalties, fines and other levies should be based on the appraised value of the tree(s) as determined using the Guide to Plant Appraisal, 9th Edition.
7. As a general rule the fundamental program guidelines such as tree committee establishment and other more static items should be included in the ordinance. Industry standards and specifications that are subject to change as the arboriculture industry evolves should be placed in separate documents which can be cited in the ordinance.

Appendix A contains suggested provisions, common elements, and language of tree ordinances found in the United States. Appendix B contains resources for writing tree ordinances.

Table 7 - COMMON ELEMENTS FOR ORDINANCE EVALUATION

Element	Explanation
Location	Defines section in municipal code where ordinance should be placed (public works, parks and recreation, zoning, or planning departments)
Purpose	The goals and objectives of the ordinance. These are crucial to implementation, enforcement, and defense of the ordinance if challenged.
Authority	The source of the local government's authority to regulate – usually its own police powers and relevant state statutes (enabling legislation).
Definitions	Terms and phrases with special meaning within the body of the ordinance. Clear, concise definitions are important to ordinance comprehension.
Designation of Administrative Responsibility	The specification of a position, department, or committee responsible for enforcing the ordinance and carrying out specified duties. Ideally, limits of authority and responsibilities are clearly defined.
Plan and/or Permit Review Process	Explanation of how a new/proposed development or other action will be reviewed. Should detail information to be submitted with permit or platting requests, such as site survey of trees and proposed building locations.
Incentives	The methods that can be used to achieve conservation & compliance with ordinance (e.g. preserved trees credited to required project landscaping).
Preservation	What is to be preserved and how it is to be accomplished. There are many approaches to this, such as retaining ≥30% of existing tree canopy.
Construction Protection Measures	Specific measures required to protect trees during construction activities. Usually involves providing a protective zone for trunk and root structures.
Nuisance Trees	Provides authority to remove trees on private property that are diseased or threaten public safety.
Maintenance After Development	Specification of required maintenance of trees and vegetation after project has been completed, often including replacement for damage-killed trees.
Appeals	Provides for possible flexibility with a process for appealing decisions, which serves as a check on authority, but can potentially undermine management.
Enforcement	Provision for enforcement, and penalties for ordinance violations. May include fines, imprisonment, withholding of permits, work stoppage, etc.

Table 8 -COMMON ELEMENTS PRESENT IN SELECTED ORDINANCES

City	Purpose	Authority	Definitions	Designation of administrative responsibility	Permit Review Process	Incentives	Preservation	Construction Protection Measures	Maintenance after Development	Appeals	Enforcement
Bellevue	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Bellingham	✓	✓	✓	✓	✓					✓	✓
Bothell	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ketchikan											
Clarkston	✓	✓									
Colville		✓	✓	✓					✓		
Covington	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Ellensburg		✓	✓	✓	✓					✓	✓
Enumclaw	✓	✓	✓	✓	✓					✓	✓
Grandview		✓	✓	✓	✓					✓	✓
Kelso	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Lacey	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Olympia	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Omak	✓	✓	✓	✓				✓			✓
Port Townsend	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Pullman	✓		✓	✓	✓	✓	✓	✓	✓		✓
Redmond	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓
Spokane	✓	✓	✓	✓	✓	✓			✓	✓	✓
Vancouver	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Walla Walla	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Woodinville	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Tree ordinances provide the borough an opportunity to set policy and back it with the force of law when necessary. It provides clear guidance for planting, pruning, removing, and other maintenance on street, park, golf, and other public trees.

The ordinance should be flexible enough to fit the needs and circumstances of the borough. The inventory data can provide the quantitative evidence for ordinance policy development.

Arboriculture and tree care maintenance and operations are very specialized fields of work. Many years of education and training are required to perform competently in the field and without harm to the trees. **Tree care performed to Ketchikan's public trees should be accomplished by International Society of Arboriculture (ISA) certified arborists or ISA certified tree workers. The language of the ordinance should reflect this standard of tree care.**

There are many existing tree ordinances and tree ordinance-writing resources. For a detailed listing of provisions for tree ordinances, see *How to Write a Municipal Tree Ordinance* by the National Arbor Day Foundation or contact your Alaska Community Forestry Coordinator for other resources.

DOWNTOWN TREES

City streets are not just thoroughfares for motor vehicles. They often double as public spaces where people walk, shop, meet, and generally participate in many social and recreational activities that make urban living enjoyable. Urban foresters, designers, and planners encourage streetscape tree planting to enhance the livability of urban streets. Large, high quality trees play important roles in community improvement. Trees are as much a part of the borough infrastructure as roads, buildings, and street lights. Extensive research has documented the environmental, social, and economic benefits of large trees for communities, municipalities, and regions.

Trees in small city business districts influence retail and shopping behavior in positive ways. The results of several studies suggest that trees are good for business. Shoppers prefer trees and consider trees an important amenity. They spend more, shop longer, and are willing to pay more for goods in business districts with mature, healthy trees.

Trees, especially large canopy trees, located at the source of pollution provide the most benefit in mitigating air pollution and sequestering carbon dioxide. Therefore, trees on busy streets and in downtown corridors sequester the carbon as the cars produce it, and provide cleaner air where high pedestrian and bicycle traffic occurs.

One of the biggest challenges for arborists, urban foresters, city planners, landscape architects, soil specialists, engineers, and public works staff is to provide sufficient soil space for root growth and tree health, in a situation where space is at a premium. The trend is to downsize the urban forest and plant smaller trees (Figure 8).

The Ketchikan's downtown business corridor has very few trees (Figure 9). The downtown is under constant competition for space. Many infrastructure items must share the same space and co-exist. The key site condition factor to consider in

Figure 8 – Small trees in a planter boxes in the downtown corridor.

resolving downtown tree conflicts is to integrate trees into the infrastructure design up front. The fundamental solution to most city tree problems is simple: Give each tree access to more and better soil.

The downtown business district is the heart of Ketchikan. As might be expected in the downtown, several organizations, property owners, and tenants are stakeholders in the management of trees. Most of the downtown is not planted with trees. If trees are present in the downtown corridor they are in planter boxes (Figure 8). Development and redevelopment of property in the downtown can mean additional planting opportunities

or it can mean facing the loss of opportunities to incorporate trees into the fabric of the downtown corridor (Figure 9).

Figure 9 – A street in the downtown corridor that is a main pedestrian artery for residents and visitors. Note the lack of trees.

An American Forests article published in the early 80's stated that an oak or maple tree is capable of living up to 400 years in the forest, up to 80 years on a college campus, up to 30 years in a heavily used park, up to 20 years along a city street and about 4 years in a downtown planting pit. Thirty years after the article was published, the same design mistakes are still being made in cities across the United States. There are several challenges when planting trees in any downtown area:

- Limited Planting Space. This is one of the greatest challenges to maintaining a healthy urban forest

Figure 10 – Trees located in small tree pits are not conducive to long-term tree survival.

in the downtown district. Small tree wells are the norm in downtowns (Figure 10). These are typically concrete walls on all sides; four feet square and leave little space for root expansion necessary for vigorous tree growth.

- Difficult Growing Conditions. In any location tree growth is limited by the conditions present in its surroundings. In the downtown, limited growing space, poor soil, heat and exposure to sun and wind impose stress on trees. Incorporating new designs that find more growing space for trees and selecting trees more tolerant of harsh growing conditions will definitely help.

- Owners and Tenants. Some business and property owners perceive trees to be an obstacle to business operations because trees create litter, block visibility of signs and displays and be difficult to maintain. The latest research indicates that trees in downtown corridors increase business, increase shopping time spent and increase the amount spent per visit (Wolf 2005). Trees and business owners in downtown corridors can co-exist and provide benefits to each other.

- Poor Maintenance. Many people do not understand how trees grow or how to best care for them. Trees in downtown areas often go without any regular care. Some trees are topped to clear signs and they become a liability to the adjoining property and the borough. Education is crucial to helping owners, tenants and contractors understand proper pruning and tree care can create assets rather than liabilities.

- Tree Grates and Guards. As trees grow and mature, their trunks can come into conflict with the grates covering the planting hole. Roots from the trees often grow into the soil under the sidewalk, cracking and heaving the concrete (Figure 11). Grates can girdle trunks in a short time without maintenance. If left in place, the grates can damage the trees they were meant to protect. The grates are also trip hazards. Their use should be limited and temporary.

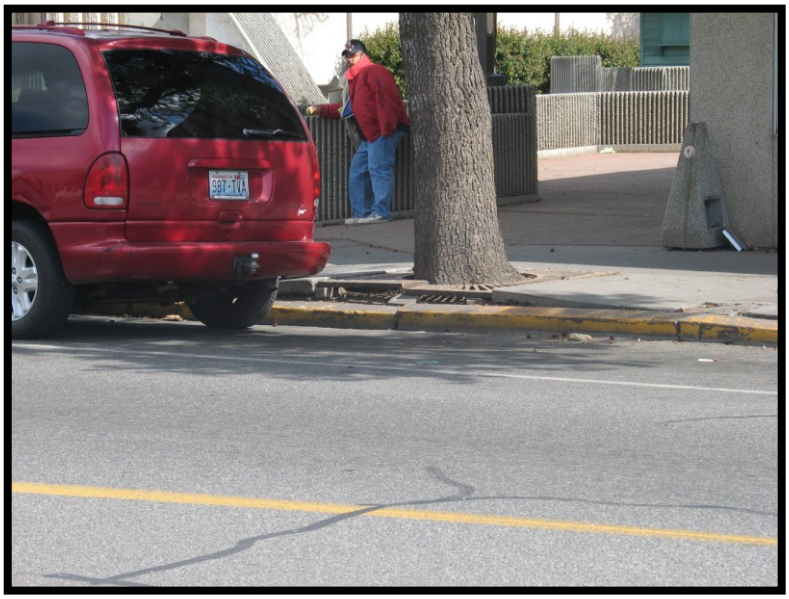


Figure 11– Tree grates girdle trunks and create trip hazards.

Often, the downtown and other business districts are selected as high priority areas to increase the beauty and attractiveness. Traditionally, downtown trees were installed according to traffic engineering design standards that did not consider the biology and culture requirements of trees.

Tree plantings in the Ketchikan downtown business district add greatly to the economics and aesthetic appeal of the city. Trees are critical elements of the urban infrastructure

and should not be an afterthought relegated to incidental open spaces or planter boxes. They should be given a high priority in the urban fabric and be given prime consideration with other infrastructure in the downtown corridor and along city streets. A concerted effort must be made to consider suitable locations for trees at the beginning of downtown design and development. Strategies must be employed to increase available soil mass, water, and air to ensure trees thrive.

Ketchikan can design, select, and use construction techniques that:

- Allow for continuous tree rows along streets with overlapping canopies forming distinct urban forest cover when practical and possible.
- Relate tree size with street width (traffic volumes) – as the street width increases so should the tree canopy.
- Relate tree size with development density (population and building height) – as the density increases so should the tree size and its canopy.
- Provide adequate space to accommodate the tree's mature structure and crown without adversely affecting other infrastructure.
- Locate trees in areas that are most favorable in sustaining tree health and longevity, minimizing tree stress, and providing adequate sunlight.
- Locate trees in site soils and microclimates most favorable to their long-term health.
- Locate trees to allow for heat gain in the winter.

Consider the use of bump-outs, traffic circles, and roundabouts to accommodate a greater number of trees nearer the source of pollution.

Balance planting trees in small groups (copses). These provide trees enough space to allow them to achieve their full potential. Copses of trees are healthier than specimen trees in a downtown urban environment (Figure 12). These trees can provide beauty, a look of uniformity, and a formal appearance to the shopping district.

Figure 12 – Whale Park is an excellent example of a copse where the trees, shrubs, perennials, and other plants are thriving because of adequate soil volume, water, and air.

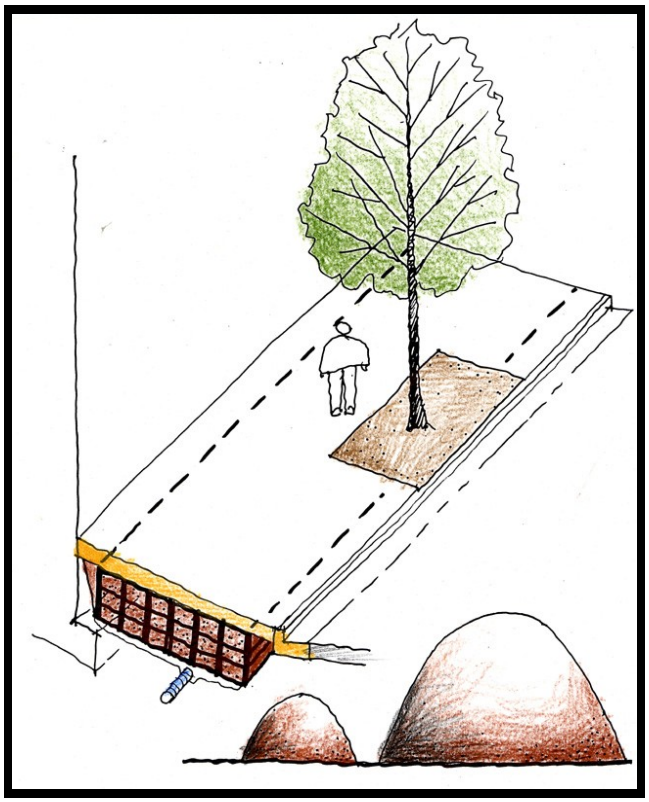


Figure 13 - Silva cells utilize a modular framework of interlocking cells. An underground planter is constructed which is backfilled with a large volume of high quality, uncompacted soil. The cells meet load bearing standards and can also help manage storm water on site.

Several new practices are being used in conjunction with construction and renovation occurring in downtowns (E.g. Silva cells, structural soils, large raised planters, and moveable planters for trees in places they can't be planted, Figure 13). Tree grates are beginning to be removed, trees in pits are being raised to grade level, mulch installation, and planting a greater variety of species is happening in downtown corridors currently. In each of these scenarios it is critical to start with quality nursery stock and plant the tree correctly. Without these first steps an accurate assessment of these practices cannot be made. It is important to assess each of these tree planting treatments under conditions that have followed the best management practices of the arboriculture industry consistently. It provides information about which treatments or combination of treatments succeeds in their downtown corridor.

The diversity of street types within a municipality calls for a diversity of design treatments. These guidelines apply specifically to the conditions found along most major streets.

- Create "gateways" to welcome those entering the city on major thoroughfares.
- Use a repetition of dominant species to make a strong, lasting impression on motorists. Consistent use of species for major streets will also reinforce the distinct character of each street.
- Mark major intersections with special plantings.
- Use informal, naturalistic tree groupings along highway and other open/rural corridors rather than straight-line planting.
- Use large trees to create a canopy of foliage over head and bring wider roads to human scale. With repetition, fall color and attractive branching patterns are appropriate for higher-speed streets where subtle effects are not noticeable by drivers.
- Protect views of surrounding open space, historic or memorable structures, and other important elements.
- Trees can be used to frame views of signs and other structures but should not obstruct them.
- Screen objectionable views, including large parking lots, with trees.

OPERATIONAL REVIEW

Ketchikan's goal is to have a larger, healthy, diverse, and functional urban forest and thriving residential and business communities. The dynamics of balancing urban forest management and other infrastructure needs, responsibilities, and assets are diverse and complex and suggest a dedicated, interdisciplinary, flexible approach and organization. However, the current constraints for comprehensive and effective urban forest management borough can be considered formidable.

Budget

The lack of dedicated and adequate financial resources for tree management and maintenance precludes making significant improvements to the community trees. Currently, there is no line item or designated regular funding for tree planting, preventive tree maintenance, tree removals, increased staff and support personnel, or equipment.

Existing public funds for urban forest management are provided from public works funds for various maintenance tasks, are usually expended on park trees, and are often expended only on an emergency basis, by limited citizen requests, for individual capital projects, or for limited aspects of public tree management, such as park tree maintenance. There is no management authority over dedicated funds for comprehensive urban forest management activities, nor control and input on the expenditures made by other departments.

A community tree program will be in competition for funding with other important municipal projects and services. To compete successfully, a proposed budget should accurately estimate the program's annual costs. It should also clearly justify the need for annual and long-term funding for the program. Obtaining funds from municipal leaders can be difficult. Here are some points to remember:

- Budgeting happens every day of the year. Communicate the good things you do to elected officials regularly and include them in tree planting and other positive opportunities. Key decision makers and the public should be kept well informed about the program's accomplishments and needs.
- Citizens are reluctant to support new programs or increased taxes. Without an increase in revenues, municipal managers cannot provide new services unless they cut others. To obtain funding, the officials must be persuaded that a community tree program is a wise investment. Most municipal officials are not familiar with the benefits or technical details of community forestry, so the budgeting process should be educational as well.
- Sound information is crucial in developing good budgets. Annual work plans should be used to calculate the program's costs. You must understand the financial reality of your request as it fits the constraints of the municipal budget.
- A cost-effective community tree program will better compete for scarce budget dollars. The program's costs can be reduced through sound administrative practices such as employee training, accurate record keeping, preventive maintenance, and selection of well-adapted trees for planting. Contracting out services can also be cost effective. For instance, a consulting arborist or community forester can be hired part time, on a retainer, or on a cost-sharing basis with surrounding municipalities. These costs could be lower than paying a full-time salary.
- Remember to include the public in your program. Grassroots public support can help generate funding. Clearly document the value of the community forestry program by developing good relations with the press and service organizations.
- Accurate records of work and expenditures can provide convincing information on the need for funding. The budget for a tree program should adapt to the changing needs of a program as work is accomplished and the program becomes established. New programs may need larger proportions of a budget dedicated to tree maintenance, tree removal, and public education. Established programs may dedicate more funding for tree planting as progress is made in the removal and maintenance of trees neglected in the past.

The following suggestions can be used when developing annual budget plans. The percentages, which are samples from established programs, should be modified for the particular needs of a community's street or park trees.

- About 20 percent of the budget should be allocated for tree removal. If there are trees that need to be removed, this should be made a budget priority.
- About 40 percent should be allocated for tree maintenance activities such as pruning, watering young trees, mulching, or controlling insects and diseases.
- Public safety and caring for existing trees should take priority over planting new trees. Too many communities make the mistake of planting new trees while neglecting older, more valuable trees. Only about 20 percent of the annual budget of an established program should be allocated for new tree plantings.
- Administrative activities are an integral part of every tree program and should receive about 20 percent of the budget. When starting a program, much more of the budget should be dedicated to obtaining authorization, gaining legislative and public support, and educating the public.

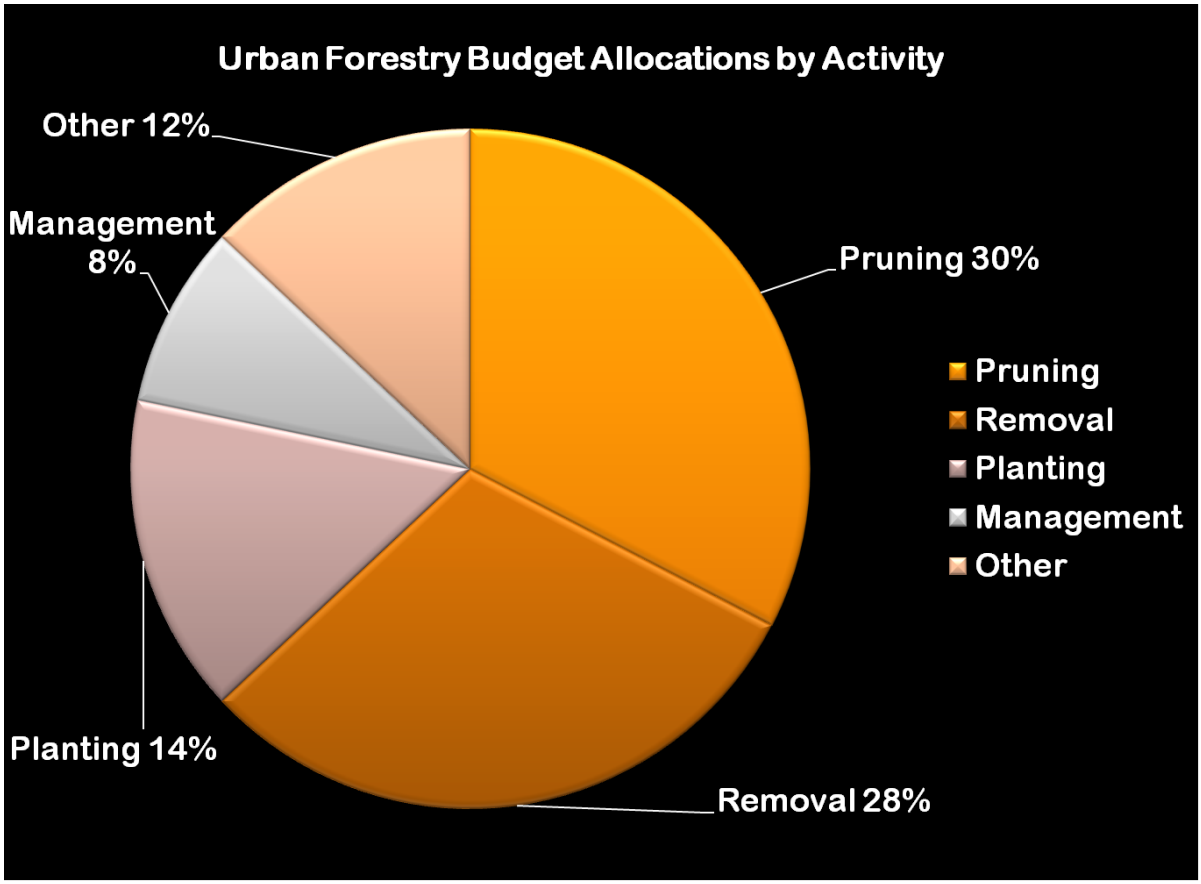


Figure 14 – Typical fund use in urban forestry tree budget allocations

Projected Multi-Year Maintenance Budgets

Typical tree budget allocations found in urban forestry programs across the United States allocate funding in these areas (Figure 14). These are approximations but provide an accurate representation of fund allocations. The priority should be to take care of what you have before substantially adding to the street tree population.

The National Arbor Day Foundation (NADF) suggests $2.00 per capita for urban forestry funding criteria to meet minimum TREE CITY USA standards. The funding criterion includes many activities that do not involve tree maintenance. Ketchikan has a population of approximately 8,000 residents. The urban forestry budget based on TREE CITY USA standards is approximately $16,000.00. It is important to allocate limited funds to tree maintenance activities.

One thing many municipalities have in common is a limited budget. Traditionally, the budgets for public trees and parks are the first to be cut when money becomes tight. Many municipalities simply cannot afford a community tree program. As a result, creativity and energy are needed to find funds to support public trees and landscapes. Below are some strategies to ensure funding for urban forestry programs:

- An annual report, work plan, and budget will be used to inform elected officials of the tree board's work and funding needs (Table 9).
- An annual meeting will be held to discuss the tree board's work and funding needs.
- News articles and releases will be used to explain worthy activities, including planting, tree removals, pruning, and funding needs.
- A "memorial or heritage tree" program will be used to raise money for tree planting on streets and in parks.
- Local civic organizations and businesses will be contacted annually to discuss their participation and support of commission activities.
- Community, family, and corporate foundations will be identified and considered for support of commission activities.
- State and other government grants will be identified and considered for support of commission activities.
- Emphasize the solutions to community problems that trees offer such as stormwater abatement.

Examples of alternative funding sources:

- Grants
  - Government
  - Private
- Fees/Backcharges: Charge the department for your services, or the department that has more funds for the work done. Provide solutions to other departments' problems and charge for it.
- Inter-governmental charges: Maintenance fee recovery for road bond projects or right-of-way projects.
- Captial Improvement Funds: Trees as infrastructure cited in ordinances (Austin and Houston, Texas)
- Direct Charges

- Mitigation Payments: You damage or destroy trees, you pay for it. Use the current edition of the Guide to Plant Appraisal formulae to recover costs of damage or destruction of public property (trees).
- Special Events
  - Festivals
  - Tree Run/Walk
  - Christmas Tree Recycling
  - Business Grand Openings and Building Dedications
  - Birthday Milestones: First, 40th, 50th, etc.
  - Arboretum Plantings and Dedications
  - Community Entrance Tree Planting
  - Church Planting Projects
  - Civic Group Planting Projects
- Sales, Merchandising & Promotions
  - Historical Tree Merchandise
  - Trail of Trees/Tree Books
  - Tree Give-A-Ways
  - Firewood/Lumber/Nuts/Fruits and Other Tree Products
  - Memorial, Anniversary, and Tribute Trees
  - Sweepstakes/Contests
- Donations
  - Individuals
  - Utility Bill Donations
  - Donation Cans at Events
  - Trust In Agency Funds
  - Tourism Industry
  - Business Sponsorships
  - Event Sponsors
  - Carbon Credits
  - In-Kind By Citizens (NeighborWoods programs)

Annual Community Tree Budget Worksheet

_____
MUNICIPALITY AND YEAR

Materials		
Trees (Multiply number of trees _____ by the average cost per tree $_____.)	$_____	
Stakes, soil, mulch, fertilizer	$_____	
Pesticides/herbicides	$_____	
Computer inventory software	$_____	
Administrative and public education materials (paper, copies, brochures, educational books)	$_____	
Other	$_____	
Materials subtotal		$_____
Equipment and buildings use		
(Divide total cost by years of service life and add maintenance, utilities, and fuel costs.)		
Office space	$_____	
Equipment storage/building	$_____	
Climbing gear	$_____	
Pruning tools, chain saws, handsaws	$_____	
Trucks/aerial lifts, backhoe/front-end loader, leaf collection equipment, chipper, stump grinder	$_____	
Spray equipment	$_____	
Equipment rental (types _____)	$_____	
Other	$_____	
Equipment and building subtotal		$_____
Services (municipal, volunteer, and contracted)		
Salaries and fringe benefits (based on % of employees' time spent working with trees)	$_____	
Tree board volunteer time	$_____	
Labor (paid or volunteer) or total cost of services		
(When using volunteer labor, estimate the wage based on task.)		
Planting (Multiply hours_____ by average wage $_____.)	$_____	
Pruning (Multiply hours_____ by average wage $_____.)	$_____	
Removal of trees and stumps (Multiply hours_____ by average wage $_____.)	$_____	
Tree inventory (Multiply hours_____ by average wage $_____.)	$_____	
Emergency storm damage cleanup (Multiply hours_____ by average wage $_____.)	$_____	
Mulching, watering, fertilizing (Multiply hours_____ by average wage $_____.)	$_____	
Leaf and branch cleanup (Multiply hours_____ by average wage $_____.)	$_____	
Leaf composting (Multiply hours_____ by average wage $_____.)	$_____	
Insect control (Multiply hours_____ by average wage $_____.)	$_____	
Utility pruning and other services (Obtain estimate from company and pro-rate per year.)	$_____	
Consultant services	$_____	
Educational programs	$_____	
Delivery/transportation charges	$_____	
Administration: (permit review, grant writing, Arbor Day planning, site inspection, etc.)	$_____	
Memberships in tree organizations (state council, ISA, etc.)	$_____	
Other	$_____	
Services subtotal		$_____
Other		
Unpaid insurance claims for damaged trees	$_____	
Grant funds expended, if not included above	$_____	
Total expenditures (Use this amount in Tree City USA formula.):		$_____

Table 9 – An annual budget, no matter how small, should be presented to the Ketchikan assembly by the tree committee.

Policy

The borough has no over-arching administrative or regulatory policy for managing public trees. The borough Code briefly mentions public trees and prohibits their damage. There is no ordinance detailing the borough's responsibilities for public trees, protection of public trees, enforcement and penalties for violations, or planting guidelines and processes. Without an ordinance or formal policy authorized by the Assembly or without an administrative policy from the borough, there is only limited coordination, inefficiencies, and marginal urban forestry management. Independent departments and

agencies can continue to function and interact with little or no cooperation from each other.
The lack of an urban forestry management policy can allow borough agencies to operate with conflicting or inadequate urban forest management standards. The lack of a policy also means there is no measure by which to judge borough actions as successes or failures.

Leadership

The effectiveness of an agency is, in part, a function of its leadership. Without strong, supportive leadership, or if the leadership of the urban forestry program is not in an empowered position in the organization, urban forestry goals will struggle to be met. Whether in direct or indirect control, centralized or decentralized, the borough's administrative leadership of urban forestry needs to be recognized, focused, dedicated, and supported.

Street and park trees require yearly attention to maintain their beauty, health, and safety. The responsibility for annual care should be clearly defined and then implemented in an orderly, dependable way. In consideration of borough resources, a logical step in developing the community tree program is to utilize the tree board to assist the Public Works/Parks staff in the leadership, administration, development, and implementation of the program.

Technical and Professional Resources

An adequate complement of professionals who, individually or collectively, understand the technical, operational and administrative factors in urban forest management is needed to prescribe and monitor the borough's urban forestry activities, enforce policies and regulations, apply technical standards and practices, and review plans that affect the forest resource. Without this professional component in sufficient numbers, urban forest management decisions and actions often default to inadequately prepared decision-makers, which can have long-term, negative consequences for the forest resource. These resources can be found locally and regionally through the Alaska Community Forestry Program or through contractual arrangements with consulting arborists.

Training

It is important that staff be properly trained in the duties that are assigned. The care and maintenance of trees is no exception. Arboriculture and tree care maintenance and operations are very specialized fields of work. Many years of education and training are required to perform competently and safely in the field and without harm to the trees. Tree care performed to Ketchikan's public trees should be accomplished by ISA certified arborists or certified tree workers.

Annual training is a mandatory element in keeping staff updated on the latest safety methods and practices in the arboriculture industry. Staff training is essential for working safe, efficient, following the best management practices of the arboriculture industry, and for advancing Ketchikan's urban forestry program into the future.

Political Support

Support from elected officials and the citizens is critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the

public and private urban forests, and without greater political support and increased citizen understanding and commitment, urban forest management in Ketchikan may not reach its full potential.

PROGRAM ACTIONS

Actions and recommendations required to work toward the management goals that are prioritized and undertaken by the borough staff working in concert with the tree council, contractors and citizens of Ketchikan.

Short-Term Action Items

There are four program management elements that must be addressed on an annual basis: Risk Tree Abatement, Proper Tree Maintenance, Tree Planting, and Program Administration. Although each of these programs is essential to the maintenance of the community forest, an annual operating plan should be established to determine where budget dollars will be spent. Borough staff and the tree committee have established public safety, responsible management of existing trees and tree planting as highest priorities.

Priority 1: Risk Tree Abatement

High-risk tree management is the removal of dead or dying trees and trees that have structural issues that may cause the tree or tree parts to fail. This is the highest budget priority due to potential public safety concerns. Trees with a high risk of failure or risk of losing major branches may cause property and/or personal injury.

Situations where injury or property damage has occurred from falling trees are not isolated and are well documented in the media on a regular basis. In addition to the potential for personal injury or property damage, the probability of the responsible parties being held liable for any injuries or damages increases. Such lawsuits can and have resulted in costly judgments against the defendants.

Public safety must be the primary concern in Ketchikan. Tree removals and pruning are a vital part of safety risk mitigation. The general tree population in Ketchikan is in fair condition; there are large trees with varying degrees of risk factors existing in the scaffold limbs, trunks, and roots. Many of these trees have developed structural defects. Consideration must always be made of area usage and the risk of falling limbs or trees to persons and property when putting a removal and pruning plan into action.

External indicators of increased risk trees, such as obvious root zone activity, decay fungi, or included bark, require special attention to meet the public's safety needs. Trees that display decay fungi or obvious signs of wood decay should be carefully monitored and evaluated for safety concerns and risk management. Trees with poor structure, such as those with co-dominant leaders or multiple trunks, can pose a greater failure risk than trees with good structure. All public trees in Ketchikan (especially trees in the large-size diameter class) with signs of decay and/or poor structure should be examined annually for signs of impending failure.

Priority 2: Proper Tree Maintenance

After planting an appropriate species at a site that can support adequate growth, maintenance practices such as mulching, watering, and pruning should be employed for three to five years. If trees are pruned properly three or four times during the first twenty years, they will need less frequent and less costly pruning in later years. Pruning promotes sound structural development of a tree's trunk and branches. The most important period for pruning occurs when the tree is young. Pruning large trees is costly and usually consumes a large part of any tree program's budget. By prioritizing the proper planting and pruning of young trees, a substantial savings can be realized by the entire tree program.

Early pruning performed properly will lead to long-lived healthy and safe mature trees. Pruning young trees properly produces substantial cost savings to the borough. Training young trees can provide a strong branching structure that requires less frequent pruning as the tree matures. Improved stewardship to increase the health and survival of recently planted trees is one strategy for increasing cost-effectiveness.

Proper training in young tree structural pruning would be required for Ketchikan staff responsible for this task. Additionally, these workers would be required to understand the growth-habits of the various species being planted, as well as tree biology, anatomy, and physiology. This training can be received through several sources, including urban forestry consultants, the state's Community Forestry Program, and the regional chapter of the International Society of Arboriculture. The tremendous aesthetic and financial benefits to be gained in the years to come from proper pruning of young trees are a strong incentive for educating tree crew personnel concerning proper pruning techniques. The added knowledge gained by the individuals could augment the sense of professionalism in their jobs.

Large trees are the most significant component of the borough's community forest. They form a canopy over streets, parks, and private properties. A mature tree is a costly management element, but it is important element because of safety and tree health issues. The consequences of lack of care for large trees are the creation of more risk trees and poor tree health.

Enforcing standards for pruning and other tree care is crucial in providing correct and consistent plant health care. The International Society of Arboriculture has developed pruning standards for trees. The standards are divided into four categories: crown cleaning, crown thinning, crown raising, and crown reduction.

Crown restoration, pruning for views, and other pruning are considered specialty pruning. Other helpful sets of standards to consider and include are the ANSI Standards for Arboricultural Operations—Pruning, Trimming, Repairing, Maintaining, and Cutting Brush—Safety Requirements (ANSI Z133.1, 2000) and the ANSI Standards for Tree Care Operations—Tree, Shrub, and Other Woody Plant Maintenance–Standard Practices, Pruning (ANSI A300(Part 1), 2001, Pruning). These safety and pruning standards are designed specifically for tree care operations and should be incorporated into your standards for tree care.

Systematic pruning of large trees reduces maintenance costs, increases the value of the trees, sustains the benefits of trees, and is a clear demonstration the borough is exhibiting reasonable care in maintaining its trees. Cyclic pruning shifts tree

management from reactive to proactive. The overall condition of Ketchikan's trees will be increased by improving the quality of pruning, storm damage will be greatly reduced, and the cost to prune trees will decrease as problems are addressed before they become costly. The borough should establish a pruning cycle of two to five years.

Priority 3: Tree Planting

New tree planting is an essential part of the community tree management. The health and stability of the borough's future forest depends in large part on judicious tree selection, location, and tree planting today, as well as regular maintenance of young public trees.

The key for successful tree planting is to plant quantities the borough has the ability to maintain. If you cannot maintain 100 new trees, don't plant 100 new trees. Increase new plantings each year, but in quantities that match the maintenance abilities of staff and borough resources.

To ensure the health of newly planted trees and that planted trees thrive, standards should be provided in the tree plan for planting techniques. These can best be expressed as general guidelines with references to technical publications. A great deal of information about the size of planting pits, staking, and other planting practices has been developed by International Society of Arboriculture. The Alaska Community Forestry Program can provide other resources and training programs to ensure successful tree planting programs.

Priority 4: Program Support and Administration

The borough's concern for and level of dedication to urban forestry is exemplified by the recent tree inventory and management plan project and the existence of some park tree maintenance. Ketchikan's newly formed tree board members support the development of an urban forestry program.

However, the elected officials are keys to the growth and success of the Ketchikan's urban forestry program. As the ultimate policy-making group and representatives of the citizens, the mayor, assembly, and commissions can have direct influence over the current and future management of the urban forest. They can approve new and improved tree ordinances, support increases in program funding, support additional staffing levels, and generally make urban forestry issues a priority for the borough.

Support from elected officials and the citizens are critical to implement and maintain an effective comprehensive urban forest management program. The citizens own both the public and private urban forests, and without greater political support and increased citizen understanding and commitment, urban forest management in Ketchikan may not reach its full potential.

Program administration refers to the supervision, scheduling, coordination, planning and education for the borough's tree program. These tasks are varied and numerous and should be addressed through the coordinated effort of borough administration and staff and an advisory tree board. Much of the field work will be performed through contractual agreements with consultants and commercial tree care firms. It is the responsibility of the borough administration, borough staff, tree board, and residents to ensure that the best management practices are used for treatments to the borough's trees.

Long-Term Action Items

Long-range planning mainly concerns program enhancement and involves the completion of recommendations in the management plan. There are five program management elements that must be addressed to sustain the community's tree program and trees: Community Forestry Management Plan Adoption and Implementation, Increase Funds Spent on Community Trees, Community Outreach and Education, Tree Ordinance Revision, and Downtown Tree Design and Planting.

Priority 1: Adoption, Implementation, and Updates of the Five-Year Community Forestry Management Plan.

The UFMP is straightforward and comprehensive, and contains appropriate goals and activities for this community. The objectives of the UFMP are clear and far-sighted. The goal is to change the forest as it is today into one that reflects the goals of the management plan. The five year plan should be reviewed annually to determine progress, review the activities accomplished, aid in the development of annual operating plans, and plan for future activities to complete the UFMP recommendations. This ensures important components of the UFMP are accomplished and progress is made towards achieving a sustainable tree program. Long-range planning time horizons can be several years or a decade, but five years is most commonly used and is a realistic time frame for implementation of the goals and recommendations of the UFMP.

Priority 2: Increase Staff and Funds Spent On Community Trees

Community trees are a local responsibility. Federal assistance, state assistance, donations and special grants provide important help for community tree activities. However, no source of funds should be considered a substitute for including trees in the borough's budget. Abundant, healthy trees are of value to the entire borough. A tree program is as much a borough responsibility as streets, water and fire protection. Incorporating trees into the mainstream of the borough's fiscal responsibility should be a goal in Ketchikan's strategic planning for the future.

The lack of dedicated and adequate financial resources for the community trees precludes making significant improvements to the tree population. Currently, there is no designated regular funding for tree planting, preventive tree maintenance, risk management, cyclical pruning, staff training and support personnel, or equipment.

The resources for urban forest management should be increased. A truly proactive and comprehensive urban forest management program requires trained and dedicated staff to oversee management and operational activities. The important duties of tree planting, tree maintenance, risk assessment, site inspections, project management, contract administration, citizen education, and public outreach require a competent staff, equipment, and other program resources.

An adequate complement of professionals who, individually or collectively, understand the technical, operational and administrative factors in urban forest management is needed to prescribe and monitor the borough's urban forestry activities, enforce policies and regulations, apply technical standards and practices, and review plans that affect the forest resource. Without this professional component in sufficient numbers, urban forest management decisions and actions often default to inadequately prepared

decision-makers, which can have long-term, negative consequences for the forest resource.

Ketchikan's urban forestry needs have reached a point where the future management of the borough trees requires tree maintenance positions, support staff, and funds for contractors or consultants with the ability to augment the services provided by the public works staff. A job analysis could be performed to determine if new or existing job classifications should be created, whether existing staff could be trained and reassigned or if new hiring is needed, and what level of funding is needed to support the positions.

An operational review of urban forestry activities could be performed to document work processes, work quantities, personnel, use or absence of arboricultural standards, and to inventory existing equipment, tools, and office equipment. The findings and recommendation of both the job analysis and operational review are critical sources of decision-making information and baseline data for judging whether to retain the services of a consulting arborist.

Priority 3: Community Outreach and Education

Collaboration is necessary for a tree program to serve the physical, social and ecological needs of the borough's infrastructure and contribute to the community. The citizens of Ketchikan will need to be informed and educated to ensure the success of a tree program and to carry out and accomplish the recommendations of the management plan. Education is one of the best investments to garner support for the tree program. Workshops, stewardship programs and collaboration with volunteers, schools, and other civic groups can serve as a conduit for support of the program.

Methods of educating the public and encouraging participation by volunteers are important parts of a community tree plan. Examples of strategies for public education and participation for a tree plan include the following:

- Residents, civic organizations, and environmental groups will be offered opportunities to participate in tree planting and maintaining public flower beds.
- Educational materials concerning trees and other natural resources will be provided to schools, particularly grades three through ten.
- Arbor Day and Earth Day will be celebrated—with the involvement of public officials and school children—as reminders of the importance of the community forest.
- Workshops on tree planting and care and other educational programs will be provided for community residents.
- Contacts with commercial arborists and the utility company will inform them of community expectations for the quality of work on public and private trees.

Identify and involve local movers and shakers, decision makers, and other people in your community. The number one reason people volunteer is because they are personally asked.

Identify community and nonprofit groups, churches, and schools that could provide support in the form of people and meeting space. Seek and publicly acknowledge support from local banks, utility companies, and other organizations for special projects.

Identify and contact assembly members, state legislators, and borough departments using the borough's resources as leverage to attract additional funds, influence, skills, and other resources.

Priority 4: Tree Ordinance Revision

A review of the borough's documents exposed several issues not addressed in land use regulations. Tree ordinances to be effective must provide three functions: provide authority, define responsibility and establish minimum standards for management and maintenance. The tree ordinance suited to Ketchikan, and most likely to be approved in Ketchikan, is written with a thorough understanding of the natural resource, ethnic tradition, political-economic climate, legal framework of the community, and the need to manage with an ecological perspective the supports the green infrastructure.

Most forestry programs exist as a reflection of community interest in trees and operate as specified in the tree ordinance. Passage or revision of an ordinance can be a complex issue. There are many diverse groups that have a stake in tree ordinances. I recommend a broad base of community support be developed prior to attempting to develop the ordinance. The tree inventory and UFMP can provide the basis for support and the need to develop the current ordinance.

Priority 5: Downtown Tree Design and Planting

The urban forest can and does have a great impact on the long-term economic viability of Ketchikan. Many recommendations in the UFMP will improve tree structure and health and provide better management of the urban forest to support businesses in Ketchikan.

Well-planned tree planting in retail districts would improve the visual and physical experience of being in Ketchikan by providing unity, screening undesirable views, and providing shade and beauty for customers.

Trees and landscaping would be a primary element for creating a hierarchy of gateway treatments that will define and designate distinct areas of Ketchikan for visitors. Tree-lined streetscapes, especially those planted with large canopy trees where possible, are currently limited in Ketchikan, but are needed to celebrate and preserve the character of the borough.

Work with property owners, tenants, borough officials, tree committee members, and traffic engineers to create a downtown planting plan that considers tree diversity, maintenance limitations, microclimate constraints, aesthetics, and business concerns. Establish designs that ensure trees thrive in the downtown core and assess new planting designs and techniques tried recently.

CONCLUSION

Community Forestry Consultants, Inc. has completed its assignment of evaluating and making recommendations regarding the community forest of Ketchikan. This management plan provides the borough with the framework to implement the best management practices for the community forest. The management and maintenance

needs for a successful urban forestry program have been developed from the best management practices available in the urban forestry and arboriculture industry.

Timely action needs to be taken to prevent tree failures, preserve tree resources and maintain the trees of Ketchikan. Trees are valuable assets to the community. The healthier the trees are in the community the more the city's livability is improved. To realize these benefits, tree planting, pruning and removing; increased education, preservation and volunteerism is needed. The focus goes beyond the individual tree to trees throughout the borough…..to the working community forest.

The recommendations will help conserve Ketchikan's tree resource and sustain the tree canopy for future generations. Although this commitment will come with costs, the long-term benefits are significantly greater and will result in a sustainable asset for the citizens of Ketchikan today and tomorrow.

APPENDIX A – Suggested Sections for the Ketchikan Tree Ordinance

24.70 PURPOSE.

A. The borough assembly recognizes that the design of the urban environment must ultimately be for the benefit of the quality of life of the human inhabitants, and that a healthy urban forest is a key component of the quality of life. The focus of the urban forestry program will be on balancing the needs of the community with the needs of the urban forest. The purpose of this article is to promote and protect the public health, safety and general welfare by

    1. providing for the supervision of the planting, pruning, removal and maintenance of trees, shrubs and other plants within the public rights-of-way and public places of the Borough and
    2. education of and assistance to citizens to promote a healthy urban forest.

B. It is also the intent of the borough assembly that the Borough

    1. promote the restoration and preservation of desirable trees and shrubs;
    2. advocate for the establishment and retention of adequate tree planting spaces while considering the community desire for urban aesthetics; and
    3. protect residents from damage caused or threatened by the improper planting, maintenance, or removal of trees and shrubs.

24.70 ENFORCING AUTHORITY.

A. Establishment.
The urban forestry program is established within the public works/parks department, which exercises jurisdiction over trees and shrubs within the public rights-of-way, parks and other public places.

B. Responsible Official.
The director of public works is designated as the responsible official for administering the urban forestry program. The director may designate an employee as the urban forester to perform the duties to administer the program.

C. Authority.
    1. The director regulates and permits the planting, pruning, removal, replacement and maintenance of all trees and shrubs within the public right-of-way and other public places.
    2. The director with the advice and assistance of the tree board will prepare Five-year management plans, annual operating plans, and will present the plans to the borough assembly for adoption.
    3. The director with the advice and assistance of the tree board will prepare the Ketchikan Arboriculture Standards and Specifications Manual and will present the UFMP to the borough assembly for adoption.

4. The director or assigned agent examines all trees and shrubs in the borough to determine whether they are contagiously diseased, dead or hazardous, obstructing the right-of-way, or posing a threat to public safety, having the right to take samples from trees and shrubs for laboratory testing.
5. The director with the advice and assistance of the tree board will develop a plan for assisting property owners with their trees within the rights-of-way, which plan includes educational programs and criteria for financial assistance.
6. The director will develop educational programs for the public promoting proper urban forestry practices.
7. The director will facilitate and foster the citizen advisory committee to enhance citizen participation in the urban forestry program**.**

24.70 DEFINITIONS

Arboriculture Manual" Defined.

"Arboriculture manual" means the Arboriculture Specifications and Standards of Practice for the borough which contains regulations and standards for the planting, pruning, removal and maintenance of trees and shrubs on public property and a program for developing and improving the tree, shrub, and other plant resources of the community.

"Commercial Tree Work" Defined.

"Commercial tree work" means any work performed on street or public trees by a person retained by the property owner or public utility.

Director" Defined.

"Director" means the director of the public works/parks management department or his or her designee.

"Risk Tree" Defined.

"Risk tree" means any tree or tree part that poses a high risk of damage to persons or property.

"Pruning" Defined.

A. "Major pruning" means the pruning or cutting out of branches three inches in diameter or greater; root pruning; or cutting out of branches and limbs constituting greater than fifteen percent of the tree's foliage bearing area. The work shall retain the natural form of the tree.

B. "Minor pruning" means pruning or cutting out of water sprouts, suckers, twigs, or branches less than three inches in diameter, or which constitutes less than fifteen percent of the tree's foliage bearing area. The work shall retain the natural form of the tree. Removal of dead wood**,** broken branches and stubs are included within the definition of minor pruning. Minor pruning may be performed by the property owner without obtaining a permit from the borough.

"Public Place" Defined.

"Public place" means property owned in fee by the Ketchikan Gateway Borough.

"Public Utility" Defined.

"Public utility" means any organization that has a franchise to utilize the public rights-of-way.

"Right-of-Way" Defined.

"Right-of-way" means that strip of land

A. dedicated to, or over which is built, public streets, sidewalks or alleys, or

B. used for or dedicated to utilities installation within the right-of-way.

The "right -of- way" is an easement over the land of the adjoining property owner.

"Severe Crown Reduction" Defined.

"Severe crown reduction" means the specific reduction in the overall size of a tree and/or the severe internodal cutting back of branches or limbs to stubs within the tree's crown to such a degree as to remove the normal tree canopy and disfigure the tree. Severe crown reduction is not a form of pruning.

"Street Tree" Defined.

"Street tree" means any tree or shrub located within the public right-of-way.

"Planting Strip" Defined.

"Planting strip" means the area within the right-of-way easement, generally the lawn between the curb and sidewalk**;** also known as the "parking or tree lawn strip**".**

24.70. ABUTTING PROPERTY.

Maintenance Responsibilities.

A. By the Abutting Property Owner.

The property owner is responsible for the following:

1. Protection of tree health by obtaining all permits as required by this article for planting, removal, or pruning of street trees. The property owners may perform minor pruning of street trees on their property without obtaining a permit;
2. Care and maintenance of the planting strip to ensure proper health of the trees;
3. Removal and replacement of street trees which are topped or improperly pruned if the director determines that a tree's health is severely degraded;
4. Care and maintenance of trees on his or her own property in such a way as to not cause a hazard to the public safety or to the health of public, landmark, or street trees.
5. Removal of trees located on the owner's property that have been declared a public nuisance or hazard.

B. By the Public Works/Parks Department.

The Public Works/Parks department shall maintain all street trees located on planting strips adjacent to streets listed on the borough maintenance responsibility list which shall be developed by the director and the tree committee. The department shall not be responsible for maintenance or replacement of street trees or other vegetation on streets not on the maintenance responsibility list.

Commercial Tree License.

A. Any person retained to prune, plant, or remove a street tree or shrub, must be licensed to perform commercial tree work by the borough unless such person is supervised by the holder of a license.

B. A license to perform commercial tree work is issued to each applicant who meets the following qualifications:
   1. is, or has an employee who is, an arborist certified through the International Society of Arboriculture;
   2. has not been found in violation of any requirements of Chapter 24.70 within the preceding year;
   3. maintains liability insurance in the amount established by the director of risk management.

C. The license expires one year from the date of issuance, or sooner if the liability insurance lapses.

D. Licenses required by this section are Class III licenses under Chapter PMC Title 12.

E. The borough may revoke the license when the licensee commits any of the following acts or omissions:
   1. knowingly violates any of the provisions of Chapter 24.70 or any of the standards established in the arboricultural manual;
   2. knowingly combines or conspires with another person by permitting one's license to be used by such other person unless employed by the licensee.

Revocation shall be for a period of one year for the first violation, two years for the second violation, and permanent for the third violation.

24.70 ISSUANCE OF PERMIT.

Street Tree Permit Required.

A. Pruning and Removal of Trees.
   No person may perform major pruning of trees, or cause or authorize any person to prune or remove trees, in planting strips, rights-of-way, or other public places without first filing an application and obtaining a street tree pruning/removal permit from the borough.
   1. Application Data.
   The application must state the location, number and kind of trees to be pruned or removed; the kind of maintenance or other work to be done and such other information as the director may find reasonably necessary to a fair determination of whether a permit should be issued.
   2. Standards for Issuance.
   The director issues the permit if in his or her judgment the proposed work is consistent with the ordinance and the proposed method and workmanship are satisfactory.
   3. Time.
   Any permit issued shall contain a date of expiration and the work must be completed in the time allowed on the permit.
   4. Major Pruning.
   The borough requires that the pruning be performed by a person licensed by the borough pursuant to Section on Commercial Licensing.

B. Planting of Trees.
No person may plant a tree in any city right-of-ways without first obtaining a street tree permit from the borough.

C. Notice of Completion.
A notice of work completion concerning tree planting, removal, or major pruning must be given by the permit holder within five days to the director for inspection. Inspection shall be completed within ten working days.

D. Annual Permit for City and Borough Departments and Utilities with Easements or Franchises within the Rights-of-Way.
City and Borough departments and utilities may apply for an annual permit to perform pruning, planting, or removal of trees within the rights-of-way. The permit application must include an annual plan that identifies work that will be done during the year. The permit holder must file quarterly reports which will identify all work done on street trees and trees in public places.

E. Emergency Pruning and Removal.
If immediate removal or major pruning is required to protect the health and safety of the public, tree work to mitigate the immediate hazard may be performed without a permit. The director must be notified on the first working day after the tree work is begun and a permit must be obtained. In the case of a declaration of emergency notification may be made within a reasonable time**.**

F. The director may decline to issue a permit, or revoke a permit issued, to any person who refuses or neglects to comply with any of the provisions of this code.

24.70 REMOVAL OF TREES AND SHRUBS - PROCEDURE.

Removal of Trees and Shrubs.

A. The director may authorize removal of or may remove trees and shrubs situated within the rights-of-way whenever one or more of the following criteria are met.
   1. The tree or shrub is hazardous or is otherwise in violation of this section.
   2. The tree or shrub is damaging public improvements or public utilities and removal is necessary because of the installation of or potential or actual damage to, a sidewalk, parkway, curb, gutter, pavement, sewer line, underground utility, or other municipal improvement.
   3. There is infection or infestation of trees or shrubs with a disease or pest detrimental to the growth, health, or life of such trees and which infection or infestation cannot be controlled or removed.
   4. The vegetation obstructs rights-of- way.
   5. The tree's health is severely degraded because of improper pruning, including severe crown reduction.

B. When the construction services department determines that vegetation obstructs a public right-of-way, it notifies the director. Unless an emergency requires immediate abatement by the borough, the director follows the procedures in Section for pruning or removal.

C. As a condition of removal, the director requires replacement with trees or shrubs that are appropriate for the location, unless replacement is not possible.

D. If a tree is to be removed at the order of the director, unless immediate removal is necessary to protect public health and safety, he or she notifies the property owner and tenants thirty days prior to the proposed date of removal. The notice states the reason(s) for the removal and the proposed date of the removal.

E. For borough projects which will require removing one or more trees, the Department will notify the property owner and tenants thirty days prior to the proposed date of removal. A copy of the notice shall also be delivered to the office of neighborhood services within the same time frame.

Tree Risk Management Policy.

The Borough has an active policy to maintain the safety of people and public lands from potentially hazardous trees. The Borough will strive to eliminate, in a timely fashion, any tree or shrub deemed hazardous. When resources limit the borough's ability to remove high-risk trees, the borough will prioritize trees based upon the risk. The standard for rating the degree of risk of a tree will be the Pacific Northwest International Society of Arboriculture tree risk evaluation system. Initial strategies will focus on removal of high-risk trees

Tree Protection, Conservation and Preservation.

A. All street and public trees near any excavation, demolition, or construction of any building, structure, street, or utility work, must be sufficiently guarded and protected by those responsible for such work as to minimize potential injury to trees and to maximize their chance for survival. When street and public trees are near the project, any construction permits issued by the borough must be approved by the director, who may require protective measures as specified in the Arboricultural Manual.

B. No person may destroy, injure, or deface any street tree or tree on public property by any means, including, but not limited to the following methods:

1. impede the free passage of water, air, or fertilizer to the roots of any tree, shrub, or other plant by depositing vehicles, concrete, asphalt, plastic sheeting, or other material detrimental to trees or shrubs on the tree lawn or on the ground near any tree;
2. pour any toxic material on any tree or on the ground near any tree;
3. cause or encourage any fire or burning near or around any tree;
4. severely reduce the tree crown except when pruning of trees under utility wires or obstructing the right-of-way as allowed by a permit issued by the director. Removal or replacement is preferred to severe crown reduction;
5. carve, or attach any sign, poster, notice, or other object, on any tree, or fasten any rope, wire, cable, nails, screws, staples or other device to any tree except as used to support a young or broken tree; however, nothing in this section shall be construed in such a manner that it forbids lighting of a decorative or seasonal nature, provided that such lighting is not attached in such a way as to cause permanent damage to the tree;

6. Plant trees reaching an expected mature height of twenty-five feet or more under utility lines.

C. No person may prevent, delay, or interfere with the director, or his or her designee, or any borough employee in the execution or enforcement of the provisions of this article.

D. Any person responsible for a violation of this section must pay the cost of repairing or replacing any tree or shrub damaged by the violation. The value of trees and shrubs is to be determined in accordance with the latest revision of the Guide for Plant Appraisal as published by the International Society of Arboriculture (ISA).

E. In addition to remedies under section 24.70 PENALTY, violation of this section is a Class 1 civil infraction. The director has the discretion to issue a warning for a first-time violation.

24.70 PENALTY. Violation of or failure to comply with any of the provisions of this chapter shall be subject to a fine not to exceed five hundred dollars **in addition to the appraised value or cost to repair or cure or method of valuation as determined in the current edition of the Guide for Plant Appraisals.** When violations are of a continuing nature, each day the violation continues shall be a separate violation.

APPENDIX B – Tree Ordinance Writing Resources

Guidelines for Developing and Evaluating Tree Ordinances: Bernhardt, E.A. and Swiecki, T.J.;California Dept. of Forestry and Fire Protection;(http://www.isa-arbor.com/tree-ord/ordintro.htm).
Tree City USA Bulletin #9: How to Write a Municipal Tree Ordinance: National Arbor Day Foundation; (http://www.arborday.org/programs/treecitybulletinsbrowse.cfm).
Tree City USA Bulletin # 31: Tree Protection Ordinances: National Arbor Day Foundation; (http://www.arborday.org/programs/treecitybulletinsbrowse.cfm).
U.S. Landscape Ordinances: An Annotated Reference Handbook; by Buck Abbey, D. Gail Abbey; This comprehensive reference brings together and explains the planning ordinances which govern the landscapes of 300 U.S. cities.
Tree Ordinance Development Guidebook; Georgia Forestry Commission; (http://www.gfc.state.ga.us/CommunityForests/documents/2005TreeOrdinance-100.pdf).
Landscape Ordinances Research Project; A resource home page for urban design, city planning, urban forestry, site design, landscape architecture, architecture, site engineering, land use law and land development--highlighting legal standards and technical requirements for site development plan; (http://www.greenlaws.lsu.edu/sitemanager.htm).
Guide to Developing a Community Tree Preservation Ordinance; Presented by the Community Tree Preservation Task Force of the Minnesota Shade Tree Advisory Committee, this guide describes the planning process, typical ordinance elements, and resources available for the task; (http://www.mnstac.org/RFC/preservationordguide.htm).
Guide to Writing a City Tree Ordinance – Model Tree Ordinances for Louisiana Communities; (http://www.greenlaws.lsu.edu/modeltree.htm).
Research Article – Kathleen Wolf; (http://www.cfr.washington.edu/research.envmind/Roadside/Trees_Parking.pdf).
Developing a Successful Urban Tree Ordinance; Charles C. Weber, Alabama Forestry Commission.
Guidelines for Developing Urban Forest Practice Ordinances; Bell, P.C., Piamondon, S., and Rupp, M.; Oregon Department of Forestry, Forest Practices Program; Urban and Community Forestry Program. This guide is designed to assist cities and counties in the development of urban forest practice regulations; (http://www.oregon.gov/ODF/URBAN_FORESTS/docs/Other_Publications/UrbanFP.pdf).

Urban and Community Forestry: A Guide for the Northeast and Midwest United States; Ascerno, M. et al., U.S. Forest Service, Northeastern Area State and Private Forestry; This manual updates a 1990 edition which focused on the interior western region of the U.S. and includes chapters on history, benefits (aesthetic, social, recreational, wildlife, economic, and physical), programs, inventories, planning, ordinances and policy, site evaluation, tree selection and planting, soils, and maintenance; 210 pp; Undated; probable publication date, 1992.
Municipal Tree Manual; Hoefer, P.J., Himelick, E.B., and DeVoto, D.F., Urbana, IL, International Society of Arboriculture. 42 pp; Prepared in cooperation with the Municipal Arborists and Urban Foresters Society; The purpose of this manual is to be a guide for preparing new, or revising old, municipal tree ordinances.
Practice Tree Preservation: Zoning Practice, July 2006, From APA, Issue #7.
Tree Conservation Ordinances; APA Report #446 with Scenic America, Copyrighted 1993, Christopher J. Duerksen, Suzanne Richman; (http:www.amazon.com/Tree-Conservation-Ordinances-Duerksen/dp/9994880802).
Community Trees: Tree Ordinances for Iowa Communities; Wray, P., Iowa State University, Cooperative Extension Service (http://www.extension.iastate.edu/Publications/PM1429b.pdf).
General Code Publishers (on-line ordinance clearinghouse); (www.generalcode.com/webcode2.html).
LexisNexis Municipal Codes (on-line ordinance clearinghouse); (http://municipalcodes.lexisnexis.com).
American Legal Publishing Corporation (on-line ordinance clearinghouse); (http://www.amlegal.com/library).
Municipal Code Corporation (on-line ordinance clearinghouse); (www.municode.com);(http://www.municode.com/resources/code_list.asp?stateID=49).
TreeOrd software; Unique software for cities is available to help them develop ordinances that will ensure the future of their community forests. TreeOrd, an interactive CD-ROM, was developed by the Tree Trust with a grant from the USDA Forest Service. The cost is $60 plus shipping and handling; (http://www.mnstac.org/RFC/tree_order_form.PDF).

APPENDIX C – Potential Landscape Plant List

The plant list below is composed of many species not in the tree population of Ketchikan. These trees may be hardy to the Ketchikan, and are not natives but will adapt to the area. Diversification and willingness to try new species are the keys to a successful planting program.

Small Trees – Less than 25' mature height for narrow parking strips and under utility lines

Hedge Maple
Acer campestre

Height: 25-35'
Spread: 20-30'
Hardiness: -25
Tree with a dense, round canopy. Leaves are deep green with a yellowish fall color. Extremely adaptable, tolerant of dry soils and compaction. Excellent street tree in residential areas and for use under power lines. Noted for its corky, ridged and furrowed bark.

Amur Maple (treeform)
Acer ginnala

Height: 20'
Spread: 20'
Hardiness: -50
A small, hardy tree with rounded outline, glossy green leaves changing to shades or yellow and red in fall. Fragrant, but not showy flower. Very adaptable to a wide range of soils and tolerant of some shade.

Miyabe Maple
Acer miyabei

Height: 25-30'
Spread: 20-30'
Hardiness: -30
An upright oval to rounded tree. The leaves are 3 to 5 lobed, dark green with a pale yellow fall color. Tolerates some dryness and prefers full sun. No serious pests and a good choice for a small shading tree.

Pacific Sunset Shantung Maple
Acer truncatum x A. platanoides 'Warrenred'

Height: 25'
Spread: 25'
Hardiness: -30
An upright, spreading, rounded crown tree with a regular branching pattern having dark green, glossy leaves and an outstanding yellow-orange to bright red fall color. A hardy tree that has great potential for urban areas.Red

Autumn Brilliance Serviceberry
Amelanchier x grandiflora 'Autumn Brilliance' (treeform)

Height: 20'
Spread: 15'
Hardiness: -30
Tree form of serviceberry with an upright spreading crown, white flowers and a reliable, bright red fall color. The fruit is edible. Tolerates some drought.

Cumulus Allegheny Serviceberry
Amelanchier laevis 'Cumulus' (treeform)

Height: 25'
Spread: 20'
Hardiness: -30
A serviceberry with a distinct upright and oval tree habit, fleecy white flowers in spring and a yellowish to orange-scarlet fall color. Smooth gray bark.

American Hornbeam
Carpinus caroliniana

Height: 25'
Spread: 25'
Hardiness: -40
A small tree with an irregular spreading habit, with a rounded outline. Dark green leaves change to yellow, orange and scarlet in the fall. Smooth, gray, irregular twisting bark adds interest in winter. Will grow in heavy shade and wet soils.

Lavalle Hawthorn
Crataegus x lavallei

Height: 25'
Spread: 20'
Hardiness: -40
A small, dense oval canopy tree with shiny dark green foliage turning to bronzy copper-red in the fall. Usually thornless or with small one inch thorns. Quite free of rust and very adaptable.

European Euonymus
Euonymus europaeus

Height: 15-30'
Spread: 10-20'
Hardiness: -30
A narrowly upright tree in youth broadening as it ages with a rounded outline when mature. Early leaf out with a flat dark green color turning from yellow to reddish purple in fall. Fruits ripen pink to red in September and are quite attractive.

Amur Maackia
Maackia amurensis

Height: 25'
Spread: 25'
Hardiness: -25
A small round headed tree. Leaves emerge a silvery gray and gradually become dark green. Fragrant pale white flowers light the tree in July and August. Bark peels with maturity exposing a shiny amber to brown color, becoming curly in texture. Prefers moist, well drained soil, but is quite adaptable to environmental conditions.

Merril Loebner Magnolia
Magnolia x loebneri 'Merrill'

Height: 30'
Spread: 30'
Hardiness: -30
An upright habit becoming round with age. Leaves are thick and rigid, dark green and turn yellow in fall. Flowering peaks in April, where the tree resembles a white cloud covered with fragrant snowy blossoms. A vigorous grower and cherished landscape tree.

Yulan magnolia
Magnolia denudata

Height: 35'
Spread: 30'
Hardiness: -30
Tree with spreading branches somewhat irregular, producing an informal outline. Leaves are thick and resilient turning yellow in fall. Flowers are fragrant, white and 4-6 inches wide, blooming in spring. New nursery stock.

Galaxy Magnolia
Magnolia x 'Galaxy'

Height: 20 - 25'
Spread: 15'
Hardiness: -20
A tree form magnolia with a strong central leader and pyramidal to oval shape. The foliage is lustrous green and flowers are large, 8 to 10 inches wide, blooming in spring on bare stems, pink outside and white inside. Good selection for a landscape or street where space is limited or confined.

Royal Star Magnolia
Magnollia stellata 'Royal Star'

Height: 20'
Spread: 15'
Hardiness: -30
A hardy, compact, rounded tree with deep green foliage and yellow fall color. The large fragrant flowers bloom in early spring, before the leaves break. An excellent ornamental tree for small sites in urban landscapes.

Flowering Crabapples
Malus sp. (Red Flowers)
Hardiness: -20 (-30)

'Adams'
Height: 20'
Spread: 20'
Dense and rounded symmetrical habit. Pink flowers, red persistent fruit.

'Amazam' American Masterpiece
Height: 25'
Spread: 18 - 20'
Pyramidal habit. Bright red leaves emerge and mature to dark maroon. Brilliant red flowers change to unique pumpkin orange fruits in fall that persist through winter.

'Bechtel' Klehm's Improved Crab
Height: 15 - 20'
Spread: 15 - 20'
Rounded form, dense dark green foliage, turning orange to orange red in fall. Large double pink flowers cover the tree in spring. Improved strain for disease resistance. Seldom fruits, very tidy tree.

'Centzam' Centurion Crabapple
Height: 20'
Spread: 15'
Narrow upright habit, spreading slightly with maturity. Purple emerging leaves changing to bronze-green. Rose-red flowers ripen to bright red fruits persisting through the winter.

'Prairifire' Prairifire Crabapple
Height: 20'
Spread: 20'
Upright spreading habit becoming rounded. Reddish stems with foliage changing from purple to red hued green. Excellent color change from crimson buds to dark pink flowers to deep red fruits which persist through winter.

Flowering Crabapples
Malus sp. (White Flowers)
Hardiness: -20 (-30)

'Adirondack'
Height: 18'
Spread: 10'
Densely upright inverted cone shape. The cut of this cultivar combined with an overabundant white flowers in spring makes this a "standard" to which other flowering crabs are compared. Bright red fruits carry interest through winter.

'Hargozam' Harvest Gold Crab
Height: 25'
Spread: 15'
Upright, moderately columnar habit. White flowers in spring are but a precursor to the golden fruits which adorn this tree through winter making it a show stopper in the landscape.

Professor Sprenger'
Height: 20'
Spread: 20'
Stark upright habit makes for a larger more stately looking tree than other crabs. Red buds bloom white with pink tones ripening to orange-red fruits and endure on the noble frame through winter.

'Sentinel'
Height: 20'
Spread: 12'
Vase shaped, an unusual form for a crab makes its mark as an excellent street tree under power lines. Flowers are white with a touch of pink , fragrant,

with bright red fruits that carry through the winter.

like drops of rain from this elegant tree.

Persian Parrotia
Parrotia persica

Height: 20 - 30'
Spread: 15 - 25'
Hardiness: -20
Small single stemmed tree with upright to wide spreading branches, oval outline. Pink to purple emerging leaves blend to glossy green and turn a beautiful succession of yellow to orange to red in fall. An excellent selection for streets and landscapes, given size, color display and remarkable resistance to pests and disease.

Columnar Sargent Cherry
Prunus sargentii
'Columnaris'

Height: 35'
Spread: 15'
Hardiness: -30
Upright, columnar to narrowly vase shaped at maturity. Flowers, foliage and bark with the same attractive qualities as the species. The narrow habit lends itself for street tree use.

Prairie Gem Pear
Pyrus ussuriensis
'Mordak'

Height: 25'
Spread: 20'
Hardiness: -30
Densely branched and compact tree with a round canopy. Leaves are bright green, thick and leathery turning golden yellow in fall. White flowers blanket the tree in early spring. Excellent pear for urban Plantings.

Ivory Silk Lilac
Syringa reticulata
'Ivory Silk'

Height: 25'
Spread: 15'
Hardiness: -20
Tree form lilac, oval and compact with upward curving branches. Foliage is dark green, flowering when young. Displays large white flower clusters in early July.

Medium Trees – 25 to 50' mature height

Fairview Maple
Acer Plantanoides
'Fairview'

Height: 45'
Spread: 35'
Hardiness: -30
Upright oval form, slightly tapered. An improved 'Schwedler' (red-leaf) type, more narrow and upright. Leaves emerging garnet purple and mature to bronze-green. Care should be taken not to encourage diseases and pests by overuse of Maple cultivars.

Parkway Maple
Acer Plantanoides
'Columnarbroad'

Height: 40'
Spread: 25'
Hardiness: -40
Narrow oval form with a good central leader. Leaves are dark green and turn yellow in fall. Very hardy Norway cultivar and an excellent maple for city u se due to it's narrow shape and well behaved branching. A healthy tree performs well along wide streets and corridors of green. Be cautious about overuse.

Emerald Queen Maple
Acer Plantanoides
'Emerald Queen'

Height: 50'
Spread: 40'
Hardiness: -30
Forms a well shaped, dense, oval habit with upright spreading branches. A excellent green-leafed cultivar for Urban Planting. Can tolerate environmental extremes and has consistent yellow fall color.

Superform Maple
Acer Plantanoides
'Superform'

Height: 45'
Spread: 40'
Hardiness: -30
Broadly oval to rounded form. As the name suggests this tree was selected for its symmetrical and uniform growth. Leaves are green with yellow fall color. The trunk is straight and develops an excellent branch structure, very formal and solid looking maple.

Sycamore Maple
Acer pseudoplatanus

Height: 40'
Spread: 30'
Hardiness: -30
Upright spreading branches and a slightly irregular rounded crown. Leaves are dark green with no discoloration on the lower surface. Adaptable to a variety of environmental conditions, poor soils and exposed sites. Makes an excellent, informal street tree.

Armstrong Maple
Acer rubrum
'Armstrong'

Height: 45 - 55'
Spread: 15'
Hardiness: -30
Rapidly growing columnar tree. Leaves light green turning orange in fall. The bark becomes a beautiful silver-gray as the tree matures. Widely utilized in urban Plantings where space is limited for spreading types.

Bowhall Maple
Acer rubrum 'Bowhall'

Height: 40'
Spread: 15'
Hardiness: -30
Tightly formed columnar cultivar. An excellent selection for street Plantings. Nice contrast to broader species with medium green foliage. Smaller and slower to mature than 'Armstrong' with better fall color.

Northwood Maple
Acer rubrum

Height: 40'
Spread: 35'
Hardiness: -40
Broadly oval to rounded shape. Foliage is medium green. The tree can tolerate harsher winters than most, but fall color is not as reliable as other Red Maples. The trunk is rectilinear with strong branch connections. Selected from the University of Minnesota.

Red Sunset Maple
Acer rubrum
'Franksred'

Height: 45'
Spread: 35'
Hardiness: -30
Hailed as one of the best Red Maple cultivars. Trees have vigorous and symmetrical growth, developing into pyramidal to oval forms Good branch angles display dark green leaves transforming to brilliant shades of red and orange in Fall.

Black Alder
Alnus glutinosa

Height: 40 - 50'
Spread: 30 - 35'
Hardiness: -30
Fast growing tree with a broadly pyramidal habit, somewhat irregular. Dark green leaves change to yellow in the fall. These trees thrive near water and perform well in poor soils. Good tree for an alternative to willows and other poplars. The 'Pyramidalis' cultivar has an excellent narrow form and recommended for confined space areas.

European Hornbeam
Carpinus betulus

Height: 25 - 40'
Spread: 25 - 35'
Hardiness: -20
Pyramidal shape, quite dense with dark green leaves. Fall color is usually yellow but

during cold winters can turn dark red. Heat and drought resistant.
'Fastigiata', a columnar cultivar, is taller, but only spreads 15', making it preferable for confined urban spaces.

European Beech
Fagus sylvatica

Height: 40 - 50'
Spread: 15 - 40'
Hardiness: -20
Stately tree, narrowly compact to densely pyramidal to broadly oval, branching close to the ground. Leaf color varies dramatically between cultivars. It is said that the right cultivar of this tree can enhance any landscape. Care should be used with Planting lower branching trees to avoid creating a traffic nuisance.

'Fastigiata'
Fastigate Beech
Trees deep green, tight form makes it one of the most striking columnar trees.

'Riversii' Rivers Purple Beech
Broadly oval habit, foliage has striking purple shades, spring through summer.

'Zlatia'
Golden Beech
Upright pyramidal habit, young leaves are yellow maturing to golden green.

White Ash
Fraxinus americana

Height: 45 - 55'
Spread: 30 - 40'
Hardiness: -25
A variety of forms usually oval. Bark is ash-gray to grayish-brown aging with diamond furrows with slender ridges. Leaves are pinnately compound with a range of green and a variety of fall colors. Most cultivars have been selected or breed with disease and pest resistant characteristics. The trees are widely used and make good selections for urban Plantings.

'Autumn Purple'
Rounded habit, purple fall color. Signature purple ash.

'Champaign County'
Dense oval habit, yellow fall color. Thick trunk and strong branches.

'Rosehill'
Upright oval habit, bronze red fall color.
Strong central leader.

Green Ash
Fraxinus pennsylvanica

Height: 45 - 50'
Spread: 25 - 35'
Hardiness: -30
A variety of forms usually oval. Bark is ash-gray to grayish-brown aging with diamond furrows with slender ridges. Leaves have a range of green and yellow fall color. Cultivars have been selected or breed with disease and pest resistant characteristics, the tendency towards irregular growth has been reduced as well. The trees are widely used and make good selections for urban Plantings. Care should be taken not to encourage diseases and pests by overuse of any tree species.

'Bergeson'
Strong, upright growth, oval. Tends to be smaller in size.

'Cimmaron'
Narrow oval habit, Glossy green foliage, brick red fall color

'Patmore'
Symmetrical branching, oval canopy. Yellow in fall.

'Summit'
Uniform branching, narrowly oval with a good leader. Yellow fall color.

Maidenhair Tree
Ginkgo Biloba

Height: 40 - 55'
Spread: 15 - 35'
Hardiness: -25
Young trees are irregularly shaped, but finish broadly symmetrical. Usually all marketed trees are male due to the offensive smell of the female trees in fruit. The leaves are uniquely lobed and bright green on both sides, changing to bright to golden yellow in fall. Having outlived most of its enemies Ginkgo is a fine specimen for urban Planting.

'Autumn Gold'
Very uniform and balanced pyramidal tree. Spreading at maturity.

'Magyar'
Narrow pyramidal form with a strong central leader. Well spaced branches.

'Princeton Sentry'
Narrow tapering growth almost columnar. Tallest of the three.

Honeylocust
Gleditsia

Height: 35 - 45'
Spread: 35 - 40'
Hardiness: -20
Usually a tree with a squat trunk and open spreading branches. Cultivars are thornless, or have very few thorns. Often overused in landscapes which can promote pest and disease problems.

'Halka'
Heavy caliper and full even crown with an oval form. Yellow in fall.

'Moraine'
Rapid growth with a vase shape and rounded outline. Golden fall color.

'Shademaster'
Irregular vase with rectangular outline. Good form for street use. Yellow in fall.

'Skyline'
Broadly pyramidal, good branch angles. Form lends itself to urban design.

American Hophornbeam
Ostrya viginiana

Height: 30 - 45'
Spread: 25'
Hardiness: -30
Rounded oval shape made up of slender branches, sometimes arching up or down. Leaves are bright green turning yellow to brown in fall often persisting adding winter interest along with the hop like fruits. Tolerates dry conditions and free of major disease and insect problems.

Amur Corktree
Phellodendron amurense

Height: 30 - 45'
Spread: 40 - 50'
Hardiness: -30
Broadly spreading tree, leaves deep to lustrous green with a brief display of yellow or bronze in fall. The bark of mature trees is unusual and quite striking. Remarkably free of pests, pH adaptable, tolerant to drought and pollution making it a great urban tree if given enough space to fill out.

'His Majesty'
Male, free of seed litter. Thick leathery leaves on stout branches.

Korean Mountainash
Sorbus alnifolia

Height: 40 - 50'
Spread: 20 - 30'
Hardiness: -30
Form changing from pyramidal to rounded outline at maturity. Leaves differing from other mountain ashes, look more beech like, as does the trunk. Striking tree with an excellent combination of form, foliage, flowers, fruit and bark. Considered the best of the Mountain Ashes.

American Linden
Tilia americana

Height: 35 - 50'
Spread: 20 - 35'
Hardiness: -40
Tall stately trees, cultivars generally smaller in size especially when used in urban areas. Leaves are generally 4 to 8 inches long and about as wide in a range of green shades. Bark is gray to brown with narrow lateral furrows. The wood is soft and easily prunes, but is elastic enough to handle most weather extremes. These trees will entirely block the sun in their shadow so place them appropriately.

'Boulevard'
Dense, narrow pyramidal habit with ascending branches. Yellow in fall.

'Legend'
Rounded pyramidal habit, yellow fall color.

'Lincoln'
Slender, upright and compact form with light green leaves, 25' by 15' in 25 years.

'Redmond'
Full pyramidal form, uniform with large leaves and red branches, winter interest.

Littleleaf Linden
Tilia cordata

Height: 40 - 45'
Spread: 45'
Hardiness: -30
Trees are pyramidal, rounding with maturity. Leaves are generally smaller, 2 to 3 inches long and wide, (except Glenleven) finely serrated and turn yellow in fall. Trunks are usually straight and bark smooth. Likes well drained alkali soils, but pH adaptable and tolerates pollution well. Makes an excellent selection for any urban Planting.

'Chancellor'
Fastigiate in youth, becoming pyramidal with age. Good branch development.

'Corzam' Corinthian Linden
Narrowly pyramidal, 15' spread. Yellow in fall. Excellent tree for limited space.

'Glenleven' Glenleven Linden
Fast growing with a straight trunk, leaves twice the size of 'Greenspire'

'Greenspire'
Single straight leader, good branch angle. Tolerates difficult conditions.

'Olympic'
Very symmetrical pyramid form, better branching than some other cultivars.

Kentucky Coffeetree
Gymnocladus dioicus

Height: 50 - 65'
Spread: 40 - 50'
Hardiness: -30
Sharply ascending branches, rising to form a narrow oval crown. The bark is unique, developing on young stems. Spring leaves are late to emerge, their pinks and purples are a nice contrast to greening trees. Seldom bothered by pests or disease, pollution tolerant and strong, upright growth make this an excellent street tree.

'Stately Manor'
Male selection, no seed pods.

Butternut
Juglans cinerea

Height: 40 - 60'
Spread: 30 - 50'
Hardiness: -30
Round topped tree with wide spreading crown of large horizontal branches and stout laterals. Leaves are dark green and woolly, white ridges and gray furrows make up the mature bark. Fruit debris may be a nuisance. Performs well in the rocky, dry and limestone based soils, a prevalent soil type in Spokane. Usable as Boulevard and Park tree.

LARGE TREES – 50' OR LARGER AT MATURE HEIGHT

Black Maple
Acer nigrum

Height: 60 - 75'
Spread: 40 - 55'
Hardiness: -25
Extremely similar to Sugar Maple with darker green leaves which have a tendency to look droopy. The fall color is more consistently in yellow or shades of yellow and some say the Black Maple can survive harsher conditions than Sugar Maple.

'Green Column'
Upright narrow oval, 20' spread. Tolerates heat. Great fall color.

Sugar Maple
Acer saccharum

Height: 60 - 75'
Spread: 40 - 55'
Hardiness: -25
Trees branch upright developing into a large oval to rounded canopy. Foliage is medium green turning bright yellow and burnt orange with red tones in fall. Urban uses in larger lawns, parks and islands of green, recommended against confined or pollution prone sites.

'Green Mountain'
Broadly oval. Very cold tolerant. Reliable fall color.

'Commemoration'
Oval to rounded. Thick, dark green leaves, reduces leaf tatter.

'Endowment'
Columnar form, well suited for confined urban sites.

'Legacy'
Very symmetrical form. Thick stem and branches. Drought tolerant.

Hackberry
Celtis occidentalis

Height: 50 - 75' (100')
Spread: 40 - 50'
Hardiness: -50
Cold tolerant tree will uncommonly obtain heights of 100 feet, but in urban settings usually does not exceed 60'. Rounded or vase shaped crown with graceful splaying of the branches. No spectacular foliage or flower display, more the trees unique character and ability to tolerate adverse conditions that make it an excellent choice for a Park or Boulevard.

Tulip Tree
Liriodendron tulipifera

Height: 70 - 90'
Spread: 35 - 50'
Hardiness: -20
Tree develops quickly with a tall straight trunk , several large sinuous branches develop a narrow oval frame. The leaves actually appear tulip like medium green changing to yellow and golden in autumn.

Cucumbertree Magnolia
Magnolia acuminata

Height: 50 - 80'
Spread: 40 - 80'
Hardiness: -25
Pyramidal growth habit when young aging to a broad-rounded outline with massive spreading branches often arching towards the ground. Foliage is dark green, flowers are smaller than some magnolias, but in abundance. Makes a great tree for parks, golf courses and other open areas, where it can have room to spread.

Black Walnut
Juglans nigra

Height: 50 - 75' (100')
Spread: 50 - 75'
Hardiness: -20
Develops a rounded well formed crown that is devoid of branches a third to two thirds the way up the tree. Leaves are finer than Bitternut and less furry. Bark is brown to grayish black and roughly diamond shaped. May inhibit the growth of other plants near the site. Tolerates dry conditions and can be used for streets where ground clearance is needed, but performs best when used for Parks and Boulevards, due to dropping fruit.

Dawn Redwood
Metasequoia Glyptostroboides

Height: 60 - 100'
Spread: 25 - 40'
Hardiness: -20
Deciduous conifer, tall pyramidal or conical form. Large basal spread. Bright green foliage, renewed every year. Grows rapidly and tolerate wet sites if drainage is not restricted. In winter the skeletal frame of larger trees is starkly majestic. Definitely a tree for large areas so select sites appropriately.

Bloodgood London Planetree
Platanus x acerifolia 'Bloodgood'

Height: 50 - 80'
Spread: 40 - 60'
Hardiness: -15
Broadly pyramidal, rounding with thick spreading branches at maturity. Large basal spread. Large maple like leaves turn yellow in fall. Bark is peeling creating a brown/cream mottling with year round interest. Better resistance to anthracnose disease than other sycamores but still can be a problem if trees are over used.

White Oak
Quercus alba

Height: 60 - 80'
Spread: 50 - 70'
Hardiness: -30
Juvenile shape is pyramidal maturing with a broad and majestic crown. Leaves are bluntly lobed, dark green to blue-green. Autumn color varies from brown to red. A challenge to transplant and establish, but worth the effort.

Bur Oak
Quercus macrocarpa

Height: 55 - 80'
Spread: 50 - 70'
Hardiness: -40
Weakly pyramidal or oval to start, developing into a large broad-rounded tree with a massive trunk. Foliage is partially lobed, dark green above and grayish below, turning yellow-brown to purplish in fall. Corky bark on smaller branches adds interest. Adapts to a wide range of soil types, drought and pollution tolerant, makes an excellent tree for urban areas where acorn debris can be managed.

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